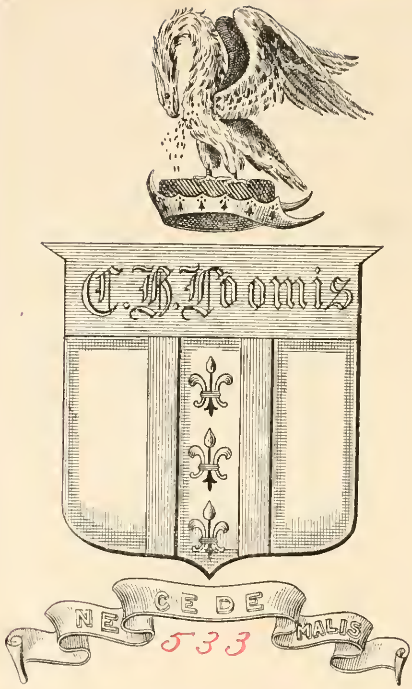
SCIENCE GOSSIP.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HARDWICKE'S

SCIENCE-GOSSIP:

1885.

HARDWICKE'S

Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

J. E. TAYLOR, Ph.D., F.L.S., F.G.S., F.R.G.S.I.,

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ASSISTED BY

J. W. BUCK, B.Sc., &c.

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PREFACE.

SOME years ago Professor Huxley delivered a lecture at the Royal Institution, entitled "The Coming of Age of the Darwinian Theory," celebrating thereby the momentous natural history discoveries and events, of which the brilliant discovery of our Biological NEWTON was the parent, nurse, and suggestor.

We desire only to compare great things with small. The present volume also witnesses the "Coming of Age" of SCIENCE-GOSSIP. For twenty-one years we have endeavoured to meet the tastes of students of natural science—to treat of the discoveries, theories, opinions, and guesses in every department of the same—*Ornithological Entomological*, *Conchological* (besides many other ologicals); *Botany*, in its multitudinous departments; *Geology* (including *Palæontology*, *Petrology*, *Lithology*, &c.); *Microscopy*, with its enormous and ever-increasing "Cast-net" over every science imaginable; as well as a host of subjects bordering on Astronomy, Meteorology, Chemistry, Folk-lore, and "Notes and Queries" (which latter will be found tolerably encyclopædic).

It has been a loving and loveable work on the part of the Editors. For the first seven years this Magazine had the advantage of the Editorship of Dr. M. C. Cooke—for the last fourteen years, the present Editor has had the enjoyment of personal communication with all, or nearly all, the writers whose papers have appeared in these pages.

A brief interregnum, however, has occurred. Owing to failing health, the Editor was obliged to take as long a holiday as he could. Fortunately, the same able agent who piloted Mr. R. A. Proctor through Australia as a Lecturer on Astronomy, came to England, and made a similar arrangement with the Editor of SCIENCE-GOSSIP.

He went, he lectured, he was generously, and even enthusiastically received by the warm-hearted Australian Colonists in South Australia, Victoria, and New South Wales. He has returned with refreshed mental and bodily vigour.

But, meantime, a well-known correspondent of this magazine, Mr. J. W. Buck, B.Sc., &c., was kind enough to act as Editorial *locum-tenens*, and he performed his work so well that the Editor feels he could not honestly write this Preface to the Annual Volume without recognising it.

The mere fact that we are now chronicling our "Coming of Age," reminds us of the almost numberless competitors for public favour which "twenty-one" years of active Scientific and Literary life in England must necessarily develop. Consequently, it is a proud thing to say, on the part of the Editor, that our Magazine was never so popular, never so much appreciated, never so widely circulated all over the world—in all the eventful years of its history—as it is at the time of publication of its Twenty-first Volume.

Nothing shall be wanting on the part of the Editor to enlarge the sphere, and intensify the operations of this Magazine for the future. His office is smoothed by the generous patience and kindness of his multitudinous Correspondents, who are aware that all their communications cannot appear in the *next* number—as well as by those patient students who understand the difficulty of answering hard questions in a moment.

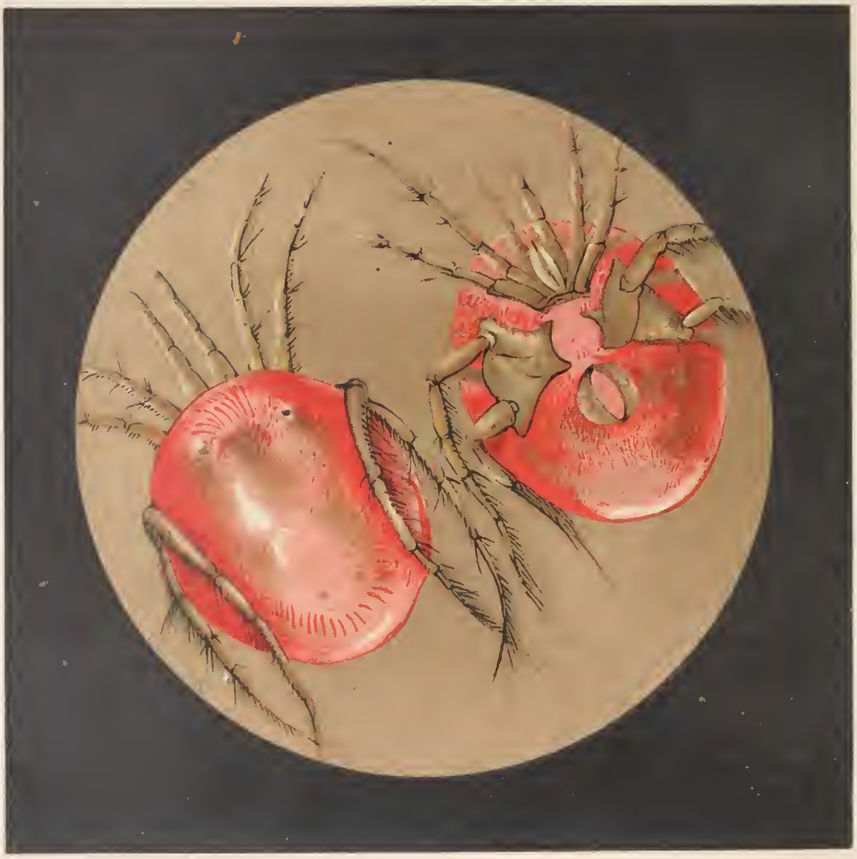
We commence a New Era with our next volume. We are taking out a new Lease of Life. The last twenty-one years has seen a good deal of the effect of natural selection. Hosts of magazines with a similar scope to ours have appeared—and *dis*-appeared. We recognise the vital fact that for a magazine to live, it must prove itself worthy of life!

Our intentions for the next volume are that our literary manhood shall be fully maintained. Will our numerous readers, all over the world, help us to carry out our intentions, by also aiding in the circulation of SCIENCE-GOSSIP?

LIST OF ILLUSTRATIONS.

LIST OF COLOURED PLATES.

GRAPHIC MICROSCOPY.



E.T.D. del, ad nat.

Vincent Brooks, Day & Son lith.

EYLAIS EXTENDENS.

DORSAL AND VENTRAL VIEW.

× 30.

GRAPHIC MICROSCOPY.

By E. T D.

No. XIII.—The Red Water-Mite (Eylaïs Extendens (?)).

IN reference to the series of twelve Plates published during the past year, the writer is desirous of thanking numerous correspondents for valuable information. chiefly relating to minute details of structure, and nomenclature; and to reply to suggestions, worthy of consideration, which, if accepted (in some instances), would advance the selection of subjects beyond the scope of "popularity" into the region of biological research. With low powers, and special illumination seeking picturesque effects, many deep and important peculiarities, possibly bearing upon classification, necessarily cannot be detailed or even exhibited; and to enter into intricacies of structure, with higher objectives (as has been proposed), would far outstrip the motive of the work; it may therefore be desirable to repeat that the *raison d'être* of "Graphic Microscopy" is to encourage the observations of our younger subscribers, in presenting them with an attractive and accurate picture of a distinct subject: simple, popular, easily procurable, and susceptible of artistic treatment.

The present example, drawn from life, under moderate amplification, necessarily screening specific character (the same individual furnishing the dorsal and ventral aspect), fairly represents in form and general appearance, a British fresh-water spider-mite, of the Order Acarina, and Family Hydrachnea, of which there are six Genera; four, Arrenurus, Atax, Eylaïs, Hydrachna, the most attractive in beauty; Diplodontus and Limnochares, parasitic and somewhat obscure.

The specimen figured is an elegant and lively individual of a form commonly met with: Eylaïs, so designated from collation with published description; the writer, however, was fortunate in the proof of the plate having been seen by Mr. C. F. George of Kirton in Lindsey, whose articles in this journal, on these particular organisms, commencing Sept., 1882, continued at intervals until August 1883, and illustrated with woodcuts of scientific importance and accuracy, establish a basis of valuable authority on the subject; the number of the eyes in these minute creatures appears to be a matter of important observation, and, as Mr. George remarks, their singular peculiarity and arrangement cannot be overlooked. In the drawing, their position is only indicated; detail would have demanded an amplification so expansive as to have taken the subject beyond the scope of a general view of the entire creature; under deeper examination, four eyes are discovered in pairs, upon the dorsal surface of the cephalothorax, approximating so closely that each pair is seemingly combined in one; even in such minute Acarina these organs possess an ocular power superior to those of insects, and often the appearance of a solitary eye under closer examination is found to be what has been happily termed "helved," the eye projecting on two rounded semi-circles, reniform, a fusion of two stemmata; a divided eye ball. Such a minute condition could not have been shown in a field involving the general aspect of the upper and under sides of the same individual, but it is a peculiarity of significant importance in the decision of species, and upon this point (apart from the portraiture of the specimen), Mr.

George is of opinion that it may be a variety of some other Family. Living specimens kindly supplied by him, disclosed this crucial peculiarity, and substantiate the division of the Group into those possessing two eyes, the Hygrobatides, and those having four, the Hydrachnides.

In every exhibition ot Microscopic life, such exclamations as "wonderful," "beautiful," "quaint," are ordinary and natural forms of expression: so perfect, startling, and novel, are such visions as revealed by fine instruments, and, conceding this sweeping admiration as a condition of the mental excitement of a casual observer, most assuredly, to the more experienced, rarely are seen gems of animation equal to these creatures when exhibited with good illumination from an argand gas flame close to the mirror, reflected through a carefully focussed paraboloid. Under such conditions these dainty mites (beyond eccentricity of form) disclose marvellous beauty of colour: scarlets, azure-blues, browns, greens and yellows, of such delicate and subdued transfusions, as might teach a lesson in tone to the finest artist, and beyond this, a vivacity of motion, a humour of attitude, that every swirl, every movement reveals fresh shimmerings of light, and more comical postures.

In the December, 1882, number of this Journal, Mr. George states that to convey even an ideal representation of their beauty requires the assistance of "colour." It may be added, as a matter of experience, that even a mere semblance requires something *more*; the highest resources of the palette can never approach "light," and what is the white of drawing paper, or the most delicate resources of the lithographer, compared with the glowing hues and blazon of microscopical illumination?

The life-history of the Hydrachnea has been fairly traced; they are found in clear ponds, and slowly running brooks, easily discovered by their peculiarity of motion and brilliancy; a mustard seed in dimensions, a ruby in appearance, routing about with unmistakable carnivorous instincts; in their earliest stage they require hospitality; at birth the young swim freely, but eventually become commensal, possibly parasitic on some aquatic insect. They then assume a condition of passive contentment, increasing in size, and passing through successive larval stages to a perfect condition, only becoming free when ready for reproduction. This is supported indirectly by Westwood, who, referring to pond beetles, states, "notwithstanding their large size, they are subject to the attacks of a *minute parasite*," at that time considered to be a perfected creature. But it was proved to be the immature state of an Hydrachna, affixed as a minute oval bag with a narrow neck to the upper side of the abdomen, infesting particularly *Dytiscus marginalis*, beneath the elytra. It is possible the Hydrachnea might be developed and reared in a tank in which the larger water beetles were kept and liberally fed; it has been observed that an excess of the larger life in a tank will develop organisms not otherwise attainable. Mexican axolotls, the size of young rats, fed once a week on raw beef, have lived in captivity for several years in a receptacle of very limited dimensions; the water never changed, but merely replenished, has always been in all seasons a world of microscopic life.

In their perfect condition, the Hydrachnea are predatory, capturing with ease, and living upon Entomostraca; they may be preserved for months in a vase with fragments of growing weeds; but living food must occasionally be supplied. They should be examined "alive" under such conditions as will subdue and restrict their activity. Mr. George states that, if a specimen be isolated in a saucer in a drop *just sufficient* to keep it endeavouring to swim, and then deluged with hot water, it will exhibit all its features, necessarily, in a passive condition. It may then be transferred to, and closed in a cell, in the same water, and kept sufficiently long to afford prolonged examination; but, as permanent objects for the cabinet they appear to be failures, the vascularity rotundity, "tightness," and delicacy of their integuments seem to defy any known preservative medium; "without pressure," they collapse, and become wrinkled; flattened, "under pressure," their integrity is too impaired, either for accurate observation, or drawing.

Crouch End.

WINTER BOTANY.

CHILLON WOODS, MONTREUX.

(December 5, 1884.)

WE had arrived at our Montreux quarters for the winter, November 26th. After one or two days of brilliant sunshine, a heavy snowstorm had set in, fully six inches lying on the ground for the next thirty-six hours. This was followed by a rapid thaw with several very bright sunny mornings. On the morning of December 5th, we determined to revisit some of our old haunts, choosing a well-known path leading from Territet through the upper village of Veytaux, and climbing the wooded mountain slopes to descend on the opposite side by the woods and Chillon Castle. In previous years we had found an endless wealth of mosses, lichen and fungi, with some few interesting flowers still lingering as late as December. Nor were we disappointed in our search. Even in the snow-covered patches the hardy little *Gentiana verna* had opened its wonderfully blue corolla under the influence of the genial sun, and we counted twenty-four separate plants, at an elevation of 1500 feet above the sea in full vigorous bloom; they were smaller plants, it is true, than the ordinary spring growth, but equally brilliant in colour. Hard

by, nestling in the thickest bed of moss, and sheltered by the stump of an old chestnut, the ever-green and tough-stemmed mountain *Polygala chamæbuxus* was in full flower; the pairs of leaves closely resemble those of the box-tree, which the varied tints of the petals shade from white to yellow, red or brown; a honey-scented plant that grows in splendid masses in spring, and very frequently in company with *Gentiana verna*. A strong spike of *Salvia verbenaca*, larger in all its parts, and far brighter in colour than an English species, was growing out of a wall. It had escaped the heavy snows, and we left the plant in the hope that sunny days might preserve the handsome coloured stem for the last few weeks of the year. In the dry bed of a mountain torrent a tall mullein stood upright, crowded with golden yellow blossom to the very tip. The leaves were smooth, slightly clasping the stem; each flower had a patch of brown in the centre, while purple hairs covered the stamens; the species apparently being *Verbascum Blattaria;* again we had not the heart to cut it down. On every wall the delicate little creeper, *Linaria Cymbalaria*, with ivy-shaped leaves and lilac flowers, was out in profusion.

Two very striking plants next claimed our attention. *Helleborus fœtidus*, type of the Christmas roses, filled almost every crevice: the dark leaves deeply cut and serrated with the lighter green of the calices, afford a most pleasing variety, especially when the sepals have a tinge of reddish purple. *Daphne laureola*, the second of these evergreen plants, is also plentifully distributed through the Chillon Woods. The leaves are entire, of a dark, shiny green; the axillary clusters of greenish flowers were in full bud, but hardly open. A little later, or rather *early* in the next year, the sweet-scented Mezereon (*Daphne Mezereon*) will be abundant higher up in these very woods, flowering before the young leaves appear. Trailing in a thicket, though not in the woods, we found a large quantity of the orange scarlet capsules of the *Physalis Alkekengi*, or winter cherry. Though not indigenous in England, many will be familiar with the orange calyx, which fades away, leaving a network surrounding the orange fruit, which is extensively used as an article of food in North Italy, at the Cape of Good Hope, and other parts of the world. A handsome decoration may be made of this plant, which preserves the orange scarlet in a dry state for many weeks after it is gathered. It is a notable fact that, while the fruit of so many genera of this order are deadly poison, the physalis is harmless. Even the fruit of the potatoe is said to be injurious, and the tubers are unwholesome in a raw state.

By the side of a trickling mountain stream a few solitary flowers of *Saponaria officinalis* still lingered, though the beauty of the delicate flesh-tinted petals was somewhat lost. Here and there a crimson cluster of berries still hung on the boughs of Guelder-rose (*Viburnum Opulus*), a shrub or tree not to be confused with *V. Lantana*, the mealy guelder-rose, so common to English hedgerows. In rocky crags, above the slopes of brush-wood, a splendid array of *Asplenium fontanum* was in full beauty; it is an evergreen fern, having lacy fronds which would enrich any collection, and is extremely easy to cultivate. It is said to have been exterminated in North Wales, where it once flourished. We would earnestly beg of botanists, not only in England, but also in Switzerland, to gather plants and ferns only with care and judgment. It is generally so easy both to obtain specimens, and at the same time to leave plenty of a plant for propagation. Unfortunately this care is not always exercised, and unscrupulous collectors are doing great harm each year in the Alps. So many thousand plants of "edelweiss," for example, have been taken recently for trade purposes, that the Swiss authorities have been compelled to publish notices to tourists and would-be collectors, strongly urging care in the matter of gathering plants. Having been diligent in botanical collecting for over fifteen years we must emphatically repeat an opinion that it is never necessary to exterminate rare plants, even while obtaining the desired specimens. *Asplenium trichomanes* and *A. viride*, we found plentiful in several parts, the former, indeed, everywhere. *A. Adiantum-nigrum* is more sparingly scattered through these woods; splendid fronds of *Polypodium vulgaris* we noted, so large as to make us wonder if it was not a different species of polypody. While naming the winter ferns, we may remark that *Polystichum lonchitis*, the holly-fern, grows in woods, the opposite side of the lake, and *Ceterach officinale* covers one wall not two miles away from Montreux. The leaves of *Chelidonium majus*, the greater celandine, were still fresh on many of the stone walls. Out of curiosity we cut through the main stem of a strong-looking plant to see if the yellow sap was still flowing; there was little trace of the colouring matter; the stem appeared dried up and shrinking away. In February the fresh life will well up into leaves and stems; the mysterious power in nature which causes the renewal of vital energy will once more be in activity, and the suspended process of growth be continued. In a corner of a vineyard at Chillon, several deep crimson flowers of *Fumaria officinalis* attracted the eye. On the grassy slopes two pink-blossomed specimens of *Erythræa centaureum* remained, all the leaves faded, and, with a few terminal flowers only; a solitary plant of *Solanum nigrum*, with a cluster of white flowers, we found on a heap of loose stones, having several of the rather large black berries on a second stem. Of the numerous fungi we cannot say more now than to note the size and beauty of the scarlet *Peziza cochinea*, which is plentiful in parts of Chillon woods.

It was a strange appearance to be gathering

gentians and other flowers in December, but no doubt hard frosts will shortly kill the few remaining species. We must then wait till February when the early "snow flakes" will show their heads, hepaticas, *Scilla bifolia*, corydalis, the crocus, sweet daphne, and an endless succession of spring flowers put forth blossoms.

To the above list of flowers on December 5, we should add *Corydalis lutea*, out in profusion on an old stone wall at the upper end of the village of Territet.

C. PARKINSON, F.G.S.

TEETH OF FLIES.

ANTHOMYIA METEORICA.

By W. D. HARRIS, Cardiff.

No. III.

HOW troublesome and teasing is that cloud of flies (*Anthomyia meteorica*) which readers must often have noticed in summer rides hovering round the heads and necks of our horses, accompanying them as they go, and causing a perpetual tossing of the former (Kirby & Spence). To this might be safely added, if they cannot find the horse they have no very decided objection to accompany the pedestrian, and he must be very thick skinned, or come from a very well behaved stock, if he is not tempted to speak of his persecutors in language more forcible than polite.

The fly is about the same size as the house-fly; is of a dark sage green colour, rather thickly covered with black hair. The wings have a tendency to assume a rusty brown hue towards the base; the legs are decidedly a dead black.

I have selected this creature as the subject of the present sketch, for the reason it may be looked upon as a typical example of form—all the teeth being similarly shaped, as in the blow-fly, but differing therefrom in the following respect: they terminate in three distinct points, having perfectly straight edges, and therefore differing from *Musca domestica* *minor.* They are very long and narrow, but, nevertheless, very strong instruments, the chitine being quite dark as compared with some creatures.

Three of the central teeth appear to be backed up with indications of a second row (*a*); but the chitine is very delicate, and if present in the remaining teeth is difficult to make out; each lobe of the proboscis contains eight teeth, and here again is a distinction which often creeps in when the same form is preserved, as will be seen later on.

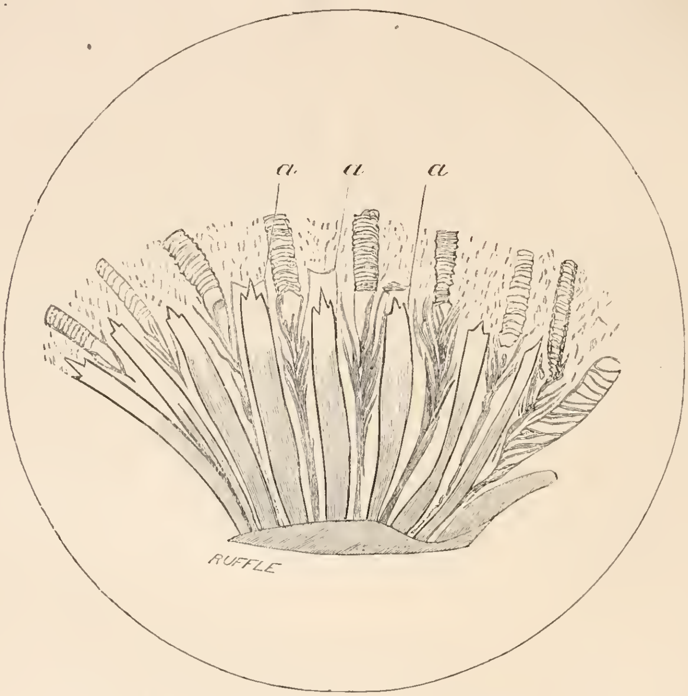


Fig. 1.—Teeth of *Anthomyia meteorica*, mag. 200 diams. *a*, position of secondary teeth.

ON the 5th December, Mr. R. Meldola, F.C.S., read a paper at the Geologists' Association, on a "Preliminary Notice of the East Anglian Earthquake" of April 22nd, 1884. Dr. Hicks also gave a paper on "Some Recent Views concerning the Geology of the North-West Highlands."

EARLY SUN-GLOWS.

THE remarkable sun-glows of last and the present year having attracted a considerable amount of attention among scientists, and being believed by many to be wholly unprecedented in the history of the earth, it may be of interest and value to give an account of the occasions on which similar phenomena have been observed in North Europe, according to the most reliable Scandinavian historians.

Such purple glows as we have recently admired have been observed in the earliest times, when people believed that they were warnings from heaven of great coming disasters, as, for instance, war, plague, or famine. There appears, however, to be no reliable record of such a phenomenon until the middle of the sixteenth century. Thus, in the summer of 1553, such a glow, or, as it was then called, fire-sign, was observed all over Denmark, Norway, and Sweden, and, strangely enough, a terrible plague visited these countries in the same year. In Copenhagen its ravages were so great that the academical lectures at the University had to be adjourned for several months, and the students left the capital.

The next glow was seen in the year 1636, when sailors, returning to Copenhagen from voyages in the Baltic and the North Sea, reported that for weeks the sky seemed on fire after sunset, and also in that year a plague visited the shores of Sweden and Denmark. By these coincidences popular superstition was further strengthened, although it was subsequently proved that the purple glow seen in 1636 was caused by a terrible eruption of Hekla, the great Iceland volcano.

On the night of January 4, 1661, a frightful storm broke over North Europe. One whirlwind after the other unroofed houses and uprooted trees in hundreds, while the tide rose so high on the coast of Jutland that large districts were flooded. For several days the sky seemed a bath of lurid fire, and a great terror was caused amongst the population, most of whom believed that the Day of Judgment had come. The celebrated Danish historian, Bishop Jens Birkerod, writes in his diary "that the sky was terrible to behold; it looked as if on fire;" while his father, Professor Jakob Birkerod, asserts that he felt shocks of earthquake in the island of Funen. The same authority records that evil prophets predicted the last day, and, as the phenomenon passed without disaster, they stated that it had only been postponed for a period of three years to give sinners time for repentance. When August 6, 1664, arrived, great terror prevailed in Denmark, and all churches were thronged to suffocation.

The next phenomenon of this nature was seen throughout Denmark, according to the first-named authority, on May 22, 1680, at sunrise. Long before the sun rose the entire heavens were filled with a blood-red light, and when the sunbeams shot forth "liquid fire seemed to rain from the sky." Again people became terribly alarmed, which was further increased by the report of a great comet approaching the earth; when it finally became visible in the following December, the popular mind was in a state of perfect madness.

Another aerial phenomenon occurred in Denmark on Shrove Tuesday, 1707. At about seven o'clock two enormous beams of light were seen running from W.N.W. to N.N.E., which made night for several hours as light as day. Some, however, refer this phenomenon to the aurora borealis, but it is strange that it should not have been more widely recognised as such in that country.

But the most recent true sun-glow was observed in 1783—exactly a hundred years ago—throughout Scandinavia. It first became visible in Copenhagen, on May 29th, and lasted until the end of September. This glow is stated also to have been seen in the whole of Europe, as well as Asia and Africa, in that year. The sky was red as blood at sunset and sunrise, but there was one great difference between this phenomenon and the last one, viz., that the sun's disk was semi-obscured during the day and almost completely so when rising and setting. In other respects, as, for instance, temperature, heat and cold, moisture and drought, the phenomena of 1783 was identical with the last one witnessed. This glow too caused great consternation in North Europe the last day being believed to be at hand. It should be mentioned as a point of weighty importance that, in the spring of the same year (the exact date is unknown), a frightful eruption of the Skapta Jökul, in Iceland, took place. This glow seemed in many respects to have resembled that of 1636, when Hekla was in terrific activity.

It will thus be seen that, although English records of sun-glows such as the recent ones are limited to one or two instances, the phenomenon has been observed in North Europe, more or less prominently, on several occasions during the last three centuries.

C. S.

GOSSIP ON CURRENT TOPICS.

By W. MATTIEU WILLIAMS, F.R.A.S.

A CURIOUS statement is made in "The Journal of Science," of last October, by a correspondent who states that, "If a workman is allowed to bring his dog into any manufactory where he is employed, it is astonishing how quickly the animal finds out 'who is who' in the concern. His profound respect for the head of the establishment, and for the managers, foremen, and office-bearers in general, forms an amusing contrast to his sauciness to private workmen." This is an observation well

worthy of experimental verification or refutation, and the required experiments may be easily made. I cannot help suspecting that the officer most likely to command the highest degree of canine respect would be the watchman or door-keeper, or whoever else had the power of turning the dog out, or allowing him to come in. If otherwise, a very interesting field of further observation is opened in the determination of the dog's mode of arriving at his conclusions concerning official status: whether the tone of command impresses him, whether he imitates the bipeds, or how otherwise he is impressed.

Further observations are also demanded in reference to a curious statement made by M. G. Rafin, in a communication to the French Academy of Sciences. He states that a large wood fire having been kindled near an ant hill in the Island of St. Thomas, the ants precipitated themselves into it by thousands, until it was completely extinguished, and he proposes to name this species of ant the *Formica ignivora*. The first impulse on reading this account of the fire-eating ants is one of incredulity, but further reflection on well-known facts modifies this impression. The fascination of a bright light on insects effects a wonderful amount of suicide. When I lived in the neighbourhood of Twickenham (towards Fulwell), I observed during three successive summers that the bottom glass of the road lamps was darkened by a deposit of very small flies that had flung themselves into the flame and perished; and that the ground around the lamps was strewn with thousands of their bodies. A multitude of similar instances may be named. Possibly the fire exerted a similar fascination upon the ants.

A correspondent to this journal (page 262) inquires concerning the food of tortoises. I found the same difficulty as he describes in feeding some that I had, but afterwards was very successful by simply placing them on a garden lawn under an inverted packing-case, in the bottom of which was an opening covered with wire gauze, or left open to supply light. They fed heartily on the clover leaves, and also ate some grass. The patches where they had been were distinctly displayed by their industrious mowing. By cutting away about three-quarters of an inch of the edges of opposite sides of the packing case, where it rested on the grass, the tortoises were enabled to shift their prison, and did so in their endeavours to burrow under the raised edges. They thus supplied themselves with fresh pasture during the summer, but died in the winter. Their mode of eating shows that it is scarcely possible for them to feed upon loose ready-gathered leaves. They do not bite the leaf through, but simply pinch it between their horny jaws, then break it by a jerk of the head, but, for this to be done successfully, the leaf must firmly be fixed by roots or otherwise.

The practice of swallowing their own cast-off skins observed by another correspondent seems to be a part of the established domestic economy of the newt during their breeding time, when they live in water. Those I kept some years ago never failed to perform this duty, though well supplied with earthworms, their staple food.

The International Conference which decided upon the adoption of an universal prime meridian, and selected that of Greenwich for the purpose, also discussed some questions of clock reform, one being the desirability of counting and naming the 24 hours all round, starting from midnight as 24 o'clock. The advantages of this, especially in railway time-tables, would be very great, and the chief objections I have heard is that which is founded on the mere indolence that shrinks from all innovation. But this is really no innovation, excepting as to the time of fixing the 24 o'clock. I spent a few months in Rome in 1842–3 when the time was reckoned in 24 hours as a matter of course; all public announcements of time were made accordingly, but for the benefit of foreigners the time of opening certain theatres, &c., was further explained by adding the "*tempo francese*," or "French time" as they called the 12-hour enumeration. The "*tempo italiano*" was counted from the *chiaroscuro*, or twilight, a very clumsy device, seeing that the 24 o'clock had to be shifted every month. Some of the public clocks had (and possibly still have) a double set of figures. Referring to an old play-bill of the Teatro Alibert, I find that the performance on the 25th January, 1843, was announced to commence "*alle ore due di notte*," at two o'clock at night, i.e., two hours after the *chiaroscuro*. In this play-bill no *tempo francese* is given.

When will science be decently represented in the organization of the British Government in such a manner that its scientific expenditure shall be wisely controlled and distributed? The pitiful anti-climax of the "Challenger" Expedition brings forth this question most glaringly. Here was lavish expenditure in the sumptuous equipment of a magnificent yacht; every conceivable luxury was generously provided for the selected few who were paid for taking a charming holiday cruise, the avowed object of which was the obtaining of certain scientific information for the enlightenment of mankind at large, and the British nation in particular. By the aid of some genuine workers at home, the crude materials of the yachtsmen have been arranged and edited to form volumes of reference. These volumes contain all the fruits of the expedition (except the pay and personal recreation supplied to the aforesaid holiday-makers); all that can come to the nation that "paid the piper" is in these volumes. All the cost of finding and arranging materials, of engraving and setting-up the volumes has been incurred, and a few copies actually printed at a total prime cost of many thousands of pounds for getting up each volume. This having been done, the multiplication of copies would cost about ninepence per pound for paper and press-work on the sheets,

and a shilling per volume more for binding decently in cloth. Such being the case, the anti-climax to which I have alluded is simply inconceivable. On application being made for copies to be sent to our public libraries, the Government has declared that it cannot afford these few ninepences per pound and shillings per copy.

Compare this with the proceedings of the Government Printing Office at Washington, whence are issued the noble records of "The United States Naval Observatory," &c. These are not only distributed freely to the American public libraries, but are sent across to the scientific libraries of Great Britain, and not only to them but to individual members of the scientific societies. I have a very valuable series of these reports, and of the Reports of the "Department of the Interior," and other works issued by the United States Government from their Printing Office at Washington. These are sent over to me through their agent, and carriage-paid to London, upon no other asking than that of replying to an official letter enclosing a list of works from which I am asked to select those I desire to have. Generally speaking they are invaluable as original records of most important and laborious scientific investigation. All Englishmen desiring to be patriotic must be bitterly ashamed of this melancholy contrast.

The present favourable position of the most wonderful and beautiful of all the heavenly bodies, the planet Saturn, with its mysterious ringed appendages, reawakens an old project that I have often longed to carry out, viz., the establishment in a suitable part of London of a popular observatory. I don't mean an establishment with amateur observers pretending to do original astronomical work, and thereby supplementing or superseding the Greenwich business; but simply a good astronomical peep-show, where millions of people who have never looked through a powerful telescope, and otherwise never would do so, might have an opportunity of seeing for themselves some of the magnified glories of the heavens. I believe that it might be made commercially self-supporting if well done, and all pedantry severely excluded. No mathematical work could be done nor need be attempted. Both reflecting and refracting telescopes equatorially mounted with the simplest of efficient clockwork would be required; and one telescopê should be provided with spectroscopic appliances. The physical phenomena are all that the popular visitor would desire to see, and the fact of having once seen the most striking of these would leave a life-long impression on all intelligent men, women, and children. A small charge, with proper regulations as to time allowed at each instrument, would cover all expenses, including a modest salary to the showman—I beg his pardon—the director. The sun and moon should be shown first with a low power to display all the disc, then with a high power for particular details.

Apropos to telescopes, Mr. Cowper Ranyard lately read to the Astronomical Soeiety a note on the blurred patches that appear in the splendid photographs of the sun taken by M. Janssen at Meudon. Janssen is himself inclined to attribute them to solar clouds or gaseous matter above the photosphere, but Mr. Ranyard has made some experiments indicating that they have their origin within the telescope itself, and are due to heated currents of air in the tube. He produced exaggerated representations of these in the form of ripples by placing a heated body inside his telescope. The difficulty of maintaining a perfect calm within the tube of a large telescope must be great, and the sensitive film used for these instantaneous photographs cannot fail to display any disturbance affecting either the transparency or refractive power of the air in the telescope. I think the question as between these two explanations might easily be settled by taking several pictures of the sun at short intervals apart. If the light patches or blurs are due to cloud-matter in the sun they should appear at the same place in all the pictures, seeing that the space represented by every square millimetre of such pictures is so enormous that no cloud could travel to a sensible distance on the picture in any short period of time; while, on the other hand, the atmospheric irregularities within the telescope must be visibly shifted during small fractions of a second.

DESCRIPTION OF A CONVENIENT FORM OF LIVE-CELL FOR OBSERVATION WITH THE MICROSCOPE, AND OF AN INEXPENSIVE MICROTOME.

THE main drawbacks of most cells for the observation of living objects are that they either leak, or are very difficult to clean. The underdescribed form, which I have lately contrived and used, obviates these defects, and may therefore be of interest to the readers of SCIENCE-GOSSIP. It is of very simple construction, and can be made up at a trifling cost by the help of any ordinary metal worker.

Take a stout ground-edged glass slip, and have fitted to it two sheaths of thin brass, about $\frac{3}{4}$-inch wide. These should be made to fit closely, but not so tightly as to prevent the glass slip from sliding easily through them. To the middle of one end of each sheath is soldered a small brass arm (shaped as in Fig. 2), carrying a fine screw on one arm, which, when secured in position, projects about $\frac{1}{4}$-inch beyond the end of the sheath.

A piece about $1\frac{1}{4}$ inch long, cut off a thin glass slide, and a thick india-rubber ring (those used for Cod's patent soda-water bottles serve excellently) completes our requirements.

To put the parts together, slip the sheaths, one on to each end of the glass slide, with their two little screw arms projecting towards each other. Now cut

a small piece out of the circumference of the india-rubber ring, and place it on the slide between the sheaths, with the opening towards one of the long sides of the slide. Place on top of the ring the short piece of glass, and slide the sheaths towards each other, till the small screws project over its ends. Then, by turning down the screws, the ring is compressed between the two pieces of glass, and a perfectly water-tight cell results. By using rings of different thickness, cells of every convenient depth may be obtained.

When one has finished working with it, the whole thing can be taken to pieces in an instant and cleaned. If a well-polished piece of glass, free from flaws, be chosen for the upper plate, its thickness will not be found to interfere very materially with the performance of any power below $\frac{1}{2}$-inch.

While on the subject of cheap apparatus, I will describe a form of microtome which can be made by any one, with a slight mechanical turn, for about eighteen-pence. In many essential points it is almost identical with that of Mr. A. B. Chapman, described in your June number, as, however, I constructed and used it more than ten years ago, I must claim to be guiltless of plagiarism.

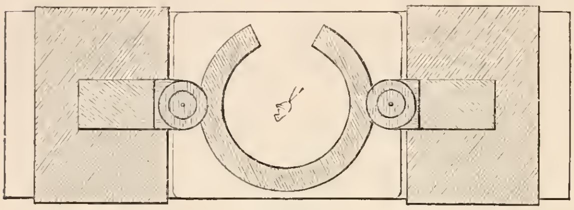


Fig. 2.—Live Cell.

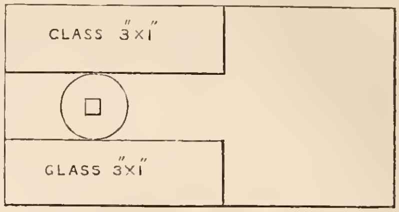


Fig. 5.—Upper Surface of Microtome.

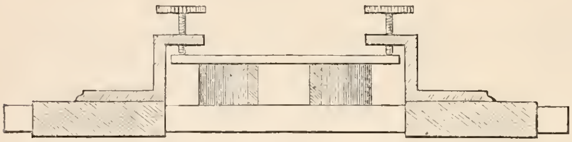


Fig. 3.—Elevation of Live Cell.

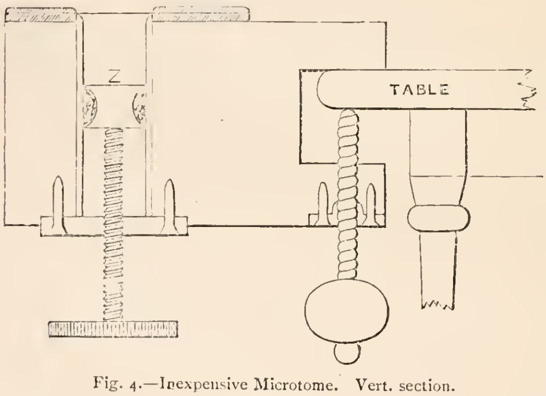


Fig. 4.—Inexpensive Microtome. Vert. section.

It consists of a block of well-seasoned wood, 5×3×3 inches. At $1\frac{1}{2}$ inch from one end of the block a hole is bored of such diameter as may be necessary to admit the cylinder of a pewter syringe of about $\frac{3}{4}$ inch internal diameter. This hole runs vertically from the upper to the lower surface of the block. Across the opposite end of the block is cut a horizontal notch, $1\frac{1}{2}$ inch deep and wide. Cut off the nozzle end of the syringe, so as to leave a piece of tube three inches long, and cut the handle off the plunger so as to leave only the piston part. This should be packed as neatly as possible, and have soldered to its upper surface a small Z-shaped piece of tin, so as to give the parapin a firm hold on the piston.

Cement the tube into the hole in the block with shellac or elastic glue, so that one end projects about the thickness of a glass slide above the upper surface, and cement on to the upper surface of the block, along each side of the projecting portion of the syringe, an ordinary ground-edged glass slide, taking care to choose a pair of equal thickness, and with well-rounded edges. Now procure a fine screw running on an oblong-nut: the nut to have a hole to take the head of a wood-screw at each end, and secure it by means of a couple of screws to the under surface of the block, so that the fine screw works up and down in the centre of the pewter tube. Get also one of the coarse iron screws with brass fittings, such as are used to fasten old-fashioned window sashes, procurable from any ironmonger, and fasten this to the under surface of block, so that the coarse screw may work into the notch already described.

To use the machine, place it with the edge of a lath projecting into the horizontal notch. Then by screwing up the coarse screw, it will be firmly clamped to the table, and projecting beyond it, a position extremity convenient for working.

Now turn down the fine screw, and push the piston, with the finger, down through the tube on to it. The well is then filled with a melted mixture of five parts solid paraffin to one part tallow, and the object to be cut embedded in this. The sections are then taken in the usual way, the two

ground edged slides acting as the guides to the razor.

With one constructed in this way, I have procured sections finer than I have got with any other non-freezing machine.

I have one further limit to add. In cementing on the two glass slides, take care that, if not quite horizontal, they may tend to form a V, rather than an A with each other, as should the inner edges be the least higher than the outer, the razor will be very quickly blunted, whereas, on account of the razor edge being, as a rule, somewhat curved, the circumstance of the outer edges being a little high is of no moment. Also do not be tempted to make your well of large diameter ; ½ inch is quite as large a section as one is likely to want, and the smaller the diameter of the well, the more even will the sections be.

Of course a brass tube and plunger may be made use of, if desired ; but, somehow, I never got one to act as well as my old "sixpenny squirt." Though I made many of them, one time and another, either for friends, or in the hope of improving the machine.

G. M. GILES, M.B., F.R.C.S.

Peshawar. *Surgeon Ind. Medical Service.*

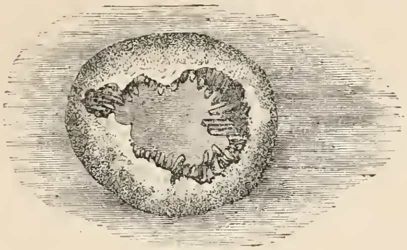


Fig. 6.—Sorus, emptied of spores, showing the paraphyses. × 80.

Fig. 7.—Paraphyses. × 250.

A NEW BRITISH PUCCINIA.

IN October last, Mr. H. Hawkes sent me, from near Birmingham, a fungus upon the leaves of Sonchus, which had the appearance of a Puccinia, but in which he could find none of the characteristic two-celled spores. A careful examination convinced me that I had, in all probability, the uredo-stage of a Puccinia hitherto, I believe, unrecorded in Britain, viz : *Puccinia sonchi*, Desmaz. First, to describe the fungus in question :—It occurred in small punctiform sori, seated on scarcely perceptible spots, on the underside of the leaves (only rarely on the upper side) ; the sori were scattered, or irregularly grouped, occasionally in orbicular clusters, round or oval, averaging 300 μ in diameter, convex and elevated. The epidermis persisted round the sori, forming a somewhat dome-shaped investment, ruptured at the summit, where it was pale in colour, but below dark-brown, owing to the paraphyses showing through. These paraphyses, which formed the most striking feature, were arranged in a single ring, surrounding the sorus, just within the persistent epidermis ; they were dark-brown, shining, oblong-cylindrical, enlarged at the apex (club-shaped), inclining inwards towards the centre, from 80–100 μ long or more, and about 12–15 μ thick. (Figs. 6 & 7.)

Within these were the uredo-spores, oval, obovate, oblong, or roundish in shape, surrounded by a very thick, colourless, warted membrane (Fig. 8, *a*) ; contents very pale yellow, with a few oily drops ; 30–50 μ long, and 20–24 μ broad. No other spores than these could be seen *in situ* ; but, on scraping off a few sori, a small number of meso-spores were observed, which differed in being of a darker brownish colour, and less or not at all warted surface ; the transition from the uredo-spores to the meso-spores could be clearly traced. (Fig. 8, *b* and *c*.) A persistent search revealed a few teleuto-spores, which were oval, not constricted, smooth, and dark-brown ; but so small was the number that I incline to the opinion that these were accidental intruders, and did not belong to the same species. They might have been blown on to the leaf from some neighbouring plant infested with a Puccinia. (Fig. 8, *d*.)

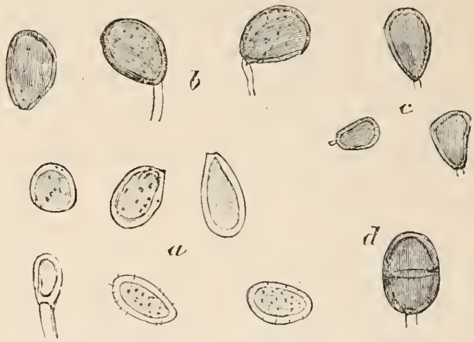


Fig. 8.—*Puccinia Sonchi.* *a*, Uredospores ; *b*, transition to mesospores ; *c*, mesospores ; *d*, teleutospore (?). × 250.

The plants on which this fungus was found were two small seedlings, not in flower, growing on rubbish which had been thrown out of the canal in cleaning it ;

every leaf was infested. If the description just given is compared with that of *P. sonchi*, which I will proceed to translate from Winter's "Pilze," p. 189, it will be seen that ours was probably the early stage of the latter, but had not yet reached the time for the production of teleutospores. The chief difference lies in the fact that I found the circle of paraphyses round the pustules of uredo spores.

Puccinia sonchi, Desm.—II. Sori at first covered by the epidermis, which is swollen like a bladder, afterwards surrounded by it like a bowl; roundish-pulvinate, scattered or grouped without order, brown. Spores roundish, ovate, elliptic or oblong, with a very thick, colourless, warted membrane, and yellow oil, 23–35 μ long, 16–21 μ thick. III.—Sori more compact than in II., roundish-pulvinate, on the stem oblong, often confluent, scattered, or arranged in circles, or even grouped without order; black, surrounded by brown paraphyses, which are clavately thickened above. Spores on a pretty long, persistent peduncle, elliptic or oblong, somewhat constricted, rounded below, or tapering into the peduncle, only slightly thickened and rounded or cap-shaped, at the apex; smooth, clear-brown, 30–60 μ long, 19–30 μ thick. Mesospores numerous, similar, but only one-celled; generally more thickened at the apex, reaching 50 μ in length.

W. B. GROVE, B.A.

HOW TO KEEP SMALL MARINE AQUARIA.

IN SCIENCE-GOSSIP for April of this year, I described two small glass-jar aquaria, which I had started in the middle of October, 1883, as an experiment, and which, up to that time, had proved most successful for so small a quantity of water. Now, on October 20th, 1884, one jar still remains, with four of its original occupants after a most trying time of it.

For the benefit of those who felt interested in my former paper, I will briefly sketch the history of my miniature aquarium during one of the hottest summers we have had for many a year.

My first death was the small *A. dianthus*, which seemed to grow gradually less for want of fresh sea-water, and ultimately died. About the end of May I left home, but before going, I changed the water of the two jars (from my reserve quart), and stood the jars in a pan of water, covering them with a piece of woollen material capable of keeping moist by capillary attraction; finally placing the whole in a cool dark place.

Upon my return, I was sorry to find the mussels dead, and the water so offensive that the winkles had crawled out, and the two old *A. mesembryanthemum*, were much contracted; the young had disappeared.

I thought this was a final collapse, especially as the weather had set in very warm. However, I found that my reserve sea-water was beautifully clear, so I poured off the tainted water, rinsed out jar number one, which was now to become the receptacle for what was still living, and poured the clear water upon the survivors. In half-an-hour matters were "in statu quo ante." *A. mesembryanthemum* unfolded their tentacles, and *Littorina littorea* recommenced their travels, although their shells began to show signs of want of lime.

The bad sea-water, the smell of which was simply unbearable, I strained carefully, and corked up in a bottle, keeping it in the dark, and shaking it up vigorously every day. In about ten days it was as clear and sweet as the other; but as the heat of the weather increased I found the greatest difficulty in keeping my little stock from decomposition. I have, however, so far succeeded, that for more than one year I kept alive four out of nine animals in a pint jar of sea-water, without introducing any fresh sea-water or any algæ.

Now that the year is up, I have put into the jar a good clump of ulva, fresh from the coast, and a piece of chalk. The effect is evidently gratifying to the prisoners, for there is a sudden addition of seven young anemones, which I saw ejected myself.

Considering the great heat, and the fact that I confined my experiment strictly to the materials I commenced with, I think that there is as little trouble in keeping a small marine aquarium as in keeping a fresh-water one, provided, of course, that one or two simple laws are followed, and that the animals selected be hardy species.

EDWARD LOVETT.

Addiscombe, Croydon.

GLASTONBURY AND ITS THORN.

By WILLIAM ROBERTS.

THE Somersetshire town of Glastonbury is one of great antiquity. It was called by the ancient Britons *Avalon*, from the abundance of apple-trees in the district; and by the Saxons *Glastn-a-byrig*, from which its present name is immediately derived.

Within a short distance of, and in a south-west direction from, the site of the present town, is situated a place known from time immemorial as "Weary Hill," and here, it is conjectured, the first society of Christian worshippers established themselves in Britain. St. Patrick, who came over from Ireland in 439, is said to have spent thirty years of his life in the convent then existing at the spot. Previous to this saint's visit, the brethren had lived in miserably furnished huts scattered round about the vicinity of the place of worship; and the primitive form of religion, which, after the death of Lucius, the first Christian king of Britain, had fallen into disuse, was again resuscitated with all its former vigour.

In 530 David, Archbishop of Menevia, with seven

of his followers, retired to Glastonbury, where they greatly improved the church and form of religion, and moreover enriched the altar with a sapphire of inestimable value.

King Arthur, after the fatal battle with his nephew Mordred, was interred in Glastonbury; his remains are said to have been discovered in the reign of Henry II., who instigated a search, which resulted in a large cross being exhumed from the tomb, bearing an inscription in rude characters something to the effect of "Here lies the famous King Arthur, buried in the isle of Avalon." Beneath was discovered a coffin-like excavation in the solid rock containing the bones of a human body, which was supposed to be that of King Arthur. These bones were deposited in the church and covered with a sumptuous monument.

In 708 Ina, king of the Saxons, in a sudden and spasmodic fit of zeal, greatly improved the convent, but it was left to Dunstan to execute alterations and improvements of any magnitude. He caused the abbey to be enlarged, and had it furnished in a state of unrivalled magnificence and splendour, to such an extent, indeed, that in a short time it became "the pride of England, and the glory of Christendom," as an old chronicler states. This was soon after the year 942.

Edgar, who had a palace within two miles of the town, and in a romantic situation still called "Edgarley,"—now a hamlet in the parish of St. John—endowed the abbey with several estates, and invested the monks with extensive privileges. The abbots lived *en prince;* the revenue having been, so far as we can ascertain, quite £40,000. This large sum of money, in common with the revenues of other abbeys, was appropriated by William I. From various causes, partly through internal ruptions and external civil wars and strife, these magnificent buildings rapidly degenerated into ruins, and nothing was present in 1797 to demonstrate a former glory, except the abbot's kitchen—which was pretty entire.

Having briefly sketched the history of the ancient town of Glastonbury, it now remains for us to mention a shrub narrowly associated with the legendary lore of this place; it is the Glastonbury thorn, a variety of *Cratægus oxyacantha.* Its origin is obscure, and even that highly-respected individual, "the oldest inhabitant," is not, as is usually the case, very dogmatic on the point. There are, however, three theories in connection with the history of this shrub. According to some, it originated with Joseph of Arimathea, who is reputed to have visited England, and, having struck his staff into the ground, the celebrated thorn of Glastonbury grew from it. It is also alleged that this same shrub was planted by St. Peter from a staff formed from the Jerusalem plant, whence the "crown of thorns" was made. The third version is that it was planted originally by St. Patrick; and if we are compelled to accept at least one of these theories let t be the last, by all means.

On Christmas Eve, 1753, a vast concourse of people attended the noted thorn at Glastonbury, expecting it to flower then; but they were disappointed. It is recorded, however, that they watched it again on the 5th of January—the old Christmas Day—*when it burst forth flower* as usual. The cause of its blooming at Christmas is accounted for by the fact that the owner of the original tree—whoever he may have been—fixed the staff into the ground on a Christmas Day, when it immediately rooted, put forth leaves, and the next day was covered with milk-white blossoms. It continued, so we are told, to bloom every Christmas Day for a series of years with great regularity. *O tempora!*

At Quainton, in Bucks, we have it authentically recorded that above ten thousand persons on one occasion went with lanterns and candles to view a thorn in that neighbourhood, which was remembered to have been a slip from that at Glastonbury.

Another presumably miraculous wonder inflicted on the credulity of the Glastonbury folks in former days was a walnut-tree, which was said never to expand its leaves before the 11th of June—the feast of St. Barnabas—but this long ago ceased to exist.

Equally absurd is a variety of legendary tales which have become interwoven with the history of this place; particularly that in connection with some Chalybeate springs. These were numerously attended formerly by invalids from all parts, ostensibly for the purpose of participating in their reputed curative qualities.

Again, adverting to the thorn, its season of flowering, and the regularity of same, is passing strange. We have had it in flower in the sunny clime of Cornwall repeatedly at, or near, but rarely before, Christmas. We have come to the conclusion, after a patient research, and sifting the exceedingly few facts known, that its pedigree is not nearly so extensive as is popularly supposed.

"THE GEOLOGICAL RECORD" AT HALDON, DEVONSHIRE.

By the REV. W. DOWNES, B.A., F.G.S.

WHEN summer visitors to Teignmouth or Dawlish have spent a day or two in boating, bathing, and strolling along the beach, and a variety in the programme of the day is becoming desirable, the first thing probably which will suggest itself to them, or be suggested by others, will be a walk upon Haldon. Nor could any better suggestion be made. That elevated plateau is equally accessible from either of the two watering places, and is about equi-distant from either. Two miles of stiff and steady up-hill work will take the pedestrian from sea-level to 760 feet above it, where he will be fully rewarded for his climb by the splendid view over land and sea which

awaits him. The conspicuous headland, known as the "Ness," and the estuary of the Teign will be immediately beneath him, and his eye will range eastward, and south-eastward along the red cliffs of S. Devon; or, if he faces the other way, along the Tors of Dartmoor. A less conspicuous object, but one which, if he be a geologist, will have a special interest for him, will be the Blackdown range, about 25 miles distant, on the far side of the Exe valley upon the Somersetshire and Dorsetshire border.

Of this Blackdown range, the Haldons are two outliers of irregular outline. Great Haldon on the north, is about five miles long, and averages about one mile in breadth, while Little Haldon, separated from the larger outlier by a slight depression in the Trias is two miles long, and rather more than half a mile wide. In ascending the hill the trias is found to extend to within 80 feet or 90 feet of the summit, when it is covered by about 50 feet of greensand, capped in turn by about 40 feet of flint gravel.

The greensand of Blackdown is famous for two things, its abundant and splendidly preserved fossil fauna, and its whetstones. The latter (though the supply is nearly exhausted) are still being cut out of the hard concretionary nodules of sandstone. At Haldon, however, the fossil fauna (corals excepted) is comparatively poor, for out of some 200 species found at Blackdown 50 only occur at Haldon. Whetstones moreover are not quarried at the latter place at all. The reason of the above facts will presently appear.

If we examine the general structure of the country, we find that horizontal beds of greensand rest unconformably upon the edges of triassic and liassic beds alike (see fig. 9). Both of the latter differ slightly to the eastward. With regard to the greensand it will be sufficient for the present purpose to subdivide it into three general portions, and to call them respectively lower, middle, and upper Blackdown beds. It will then be found that the lower and middle beds, which contain the whetstones and the chief fossiliferous zones, have thinned out to the westward, so that only the upper beds are found at Haldon. The upper beds themselves have however rather increased in thickness westward, and include a coral zone in their upper portion not found at Blackdown. This fact, together with the greatly increased thickness of the flint gravel,

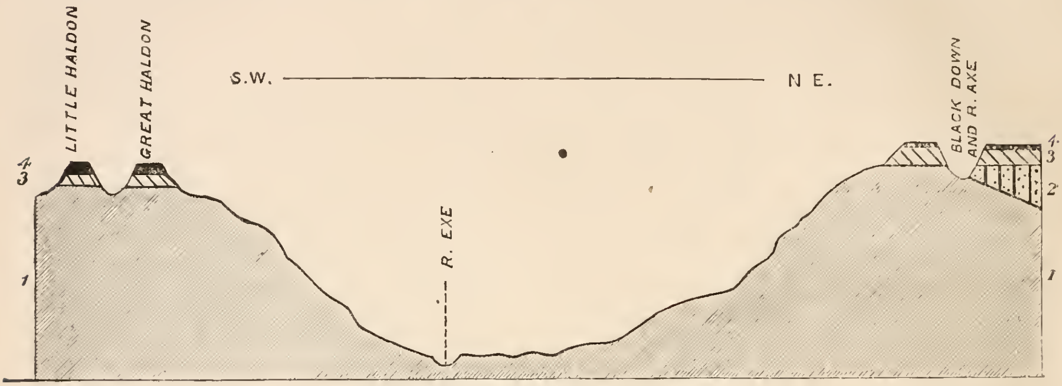


Fig. 9.—Generalised Section of South Eastern Devonshire.

Vertical scale about 800 feet to the inch. Distance horizontally, about 30 miles.

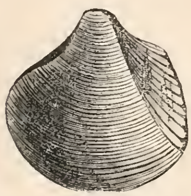


Fig. 10.—*Cardium Hillanum.*

Fig. 11.—*Exogyra conica.*

Fig. 12.—*Turitella granulata.*

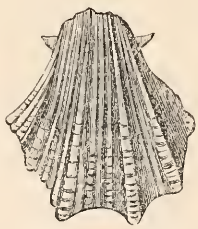


Fig. 13.—*Pecten quadricostatus.*

Fig. 14. — Fossil sponge (*Siphonia pyriformis*).

render the cretaceous matter on Haldon approximately (but not quite) as thick as at Blackdown. The corals have been described by Professor Duncan. (Q. J. G. S., Feb. 1879.)

The angular flints, which are doubtless the result mainly of sub-aerial denudation, presuppose a considerable thickness of chalk, which at one time capped the greensand, but which has now vanished altogether, with the exception of this coarser and insoluble residuum. But sub-aerial denudation is not the only physical change indicated by the flint gravel, for upon the surface and for about a foot beneath it rounded pebbles occur, not only of flint, but also of rocks foreign to the bed itself, such as quartz and grit derived from the Palæozoic rocks adjoining.

Here then again come traces of aqueous action. And the natural inference seems to be that the bed had sunk again beneath the surface of the sea, and that in this way it obtained both its rounded pebbles and its plateau features. It became in fact a plain of marine denudation. Since that time however it has been re-elevated several hundred feet, so that rain and rivers have "writ their wrinkles" upon it, and have produced a vast hiatus between the outliers and the parent mass.

In conclusion, let us sum up the record. 1. We have at the base, Trias, which was deposited probably in an inland sea. 2. Subsidence, and more truly marine conditions, when the Lias was deposited. 3. Elevation, tilting, and denudation, prior to the deposition of the greensand. 4. Subsidence, and the commencement of the deposition of the greensand beds. 5. Elevation, or silting up, or both, until shallower water and littoral conditions favoured the growth of encrusting corals and polyzoa. 6. Subsidence again till oceanic conditions prevailed, and chalk beds of

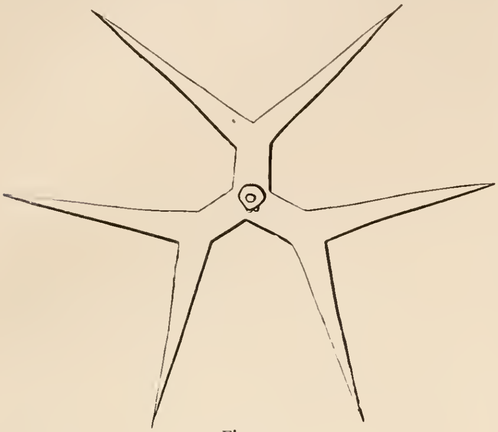


Fig. 15.

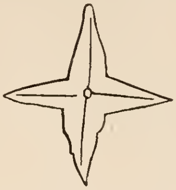


Fig. 18.

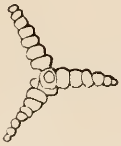


Fig. 19.

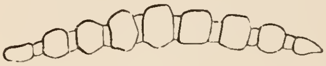


Fig. 20.

Fig. 22.

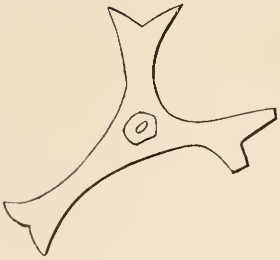


Fig. 16.

Fig. 17.

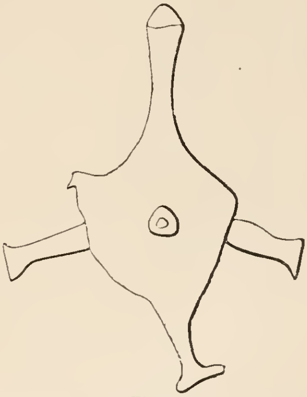


Fig. 21.

Figs. 15–22.—Fossil Sponge Spicules, all drawn on the scale of $\frac{1}{24}$th to $\frac{1}{1800}$th of an inch. (H. J. Carter on "Fossil Sponge Spicules . . . from Blackdown and Haldon," "Annals and Magazine of Natural History," for Feb. 1871, p. 139.)

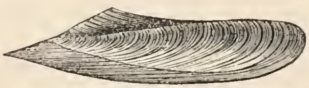


Fig. 23.—*Gervillea anceps.*

Fig. 24.—*Ammonites varicosus.*

considerable thickness were formed. 7. Re-elevation, at least above sea level, to account for the sub-aerial denudation of the chalk. 8. A slight re-subsidence, to form the marine plateau and introduce the rounded and foreign pebbles. 9. Re-elevation to the present altitude, combined with extensive recent denudation and excavation of the present valleys. Denudation has swept away enormous masses of both Trias and Greensand, but happily it is a broom which seldom sweeps quite clean, and hence Haldon is left to tell its tale.

BRITISH PLANTS IN NYMAN'S "CONSPECTUS FLORÆ EUROPÆÆ."

By A. R. Waller.

The following notes are intended to give the readers of Science-Gossip some idea of the differences in the nomenclature and classification of British plants in Dr. Nyman's "Conspectus Floræ Europææ." Dr. Nyman's work is most invaluable to all systematic and geographical botanists; as it gives the full distribution of all known European species and sub-species, and in many cases that of varieties. English botanists will have to adopt the earlier names he uses, as the only safe rule for botanical nomenclature is that of absolute priority.

The classification of the Thalictrums (meadow rues) is rather different to what we have generally been accustomed to use. *T. Jacquinianum*, K. (=*T. minus*, Jacq. non L.), is the plant we have so long called *T. majus*, Smith, "Jacq.": *T. majus*, Murr. "Jacq." is not a British plant. England might be added to the list of countries for *T. alpinum*, L. (Alpine meadow rue); it grows in Yorkshire, Westmoreland, &c. It is mentioned as growing in Scotland and Wales. The Jersey buttercup is not thought to be *Ranunculus chærophyllus*, L., but *R. flabellatus*, Dsf. var. *Europæa*. *R. sardous*, Cr., 1763, rightly replaces *R. Philonotis*, Ehrh. 1788, as the name of the hairy buttercup, and *Glaucium flavum*, Cr., 1769, instead of *G. luteum*, Sep. 1772, for the yellow-horned poppy, is another change in the right direction. *Fumaria Boræi*, Jord., is elevated to specific rank with *F. Bastardi*, Bor., 1847 (=*F. confusa*, Jord. 1848), as a sub-species. Scotland might be added to the list of countries for *F. parviflora*, Lam. We are not credited with *Iberis amara*, L. (candy-tuft); it is certainly native in the centre of England.

Lepidium Smithii, Hook., is considered a variety of *L. heterophyllum*, Bth. *Coronopus Ruellii*, All. 1785, gives way to *C. procumbens*, Gil., 1782. *Helianthemum vineale*, P., appears as a full species with *H. canum*, Dun., as a variety, thus reversing the places of the two plants. *Viola permixta*, Jord., is thought to be a hybrid between *V. hirta*, L., and *V. odorata*, L., and *Drosera obovata*, Mk., a hybrid between *D. longifolia*, L., and *D. rotundifolia*, L. *Polygala serpyllacea*, Whe., 1826, takes the place of *P. depressa*, Wend., 1831, and *Silene Cucubalus*, Wib., 1799, that of *S. inflata*, Sm., 1800 (bladder campion). *S. quinquevulnera*, L., is thought to be a sub-species of *S. lusitanica*, L. Scotland might be added to the list of countries for *Dianthus Armeria*, L. (Deptford Pink).

Sisymbrium Sophia, *Sinapis arvensis*, *Capsella Bursa-pastoris*, *Batrachium heterophyllum*, and *Violas tricolor* and *arvensis* are found in every country in Europe. *Erucastrum Pollichii*, Schp., is given as a native. At most, it is only a colonist. *Arabis ciliata*, Br., and *Brassica monensis*, Huds., are among the very few plants which are confined in Europe to Britain.

NOTES ON SOME VARIETIES OF BRITISH SHELLS.

I have in my collection several interesting varieties of British shells which do not correspond to any of the named varieties generally regarded as British, but are nevertheless fairly well marked. These I now describe. All those described below were taken by myself.

1. *Hyalina nitidula*, var. Shell large, whorls 4, slightly whitish beneath, last whorl expanded, and having a dull waxy appearance, and possessing a rather broad band in the position of No. 5 in *H. nemoralis*. Found at West Northdown, in Thanet.

2. *Hy. glabra*, var. Shell greenish-white, glossy, and semi-transparent. Bromley, with the type.

3. *Valvata piscinalis*, var. Shell shewing tracings of spiral banding. I am not sure of the exact locality, but it is from some part of Kent.

4. *Planorbis vortex*, var. Shell large, concave above, keel prominent, and placed almost in centre of periphery. From Fulham.

5. *Limnæa glutinosa*, monst. Spire very short, sunken, slightly raised at apex, body whorl swollen above, top of shell nearly flat. St. Nicholas Marsh, with type.

6. *L. peregra*, var. Shell showing spiral banding. From a ditch near Walmer Castle, Kent. (v. *picta*?)

7. *L. stagnalis*, var. Shell having short spire, body whorl large and expanded, mouth wide. Pond at Bromley with *Lemna minor*. Type form not present.

8. *L. stagnalis*, var. Shell smaller than type and shaped like *L. palustris*. Suture shallow. Shell often eroded. Pond at Chislehurst, with *Anacharis alsinastrum* and *Callitriche verna*.

9. *L. stagnalis*, var. Shell much smaller than type, usually about $\frac{3}{4}$ inch to 1 inch in length, suture rather deep. Shell eroded. Pond on Chislehurst Common, with *Potamogeton crispus* and *Ranunculus aquatilis*.

10. *L. stagnalis*, var. Shell shewing traces of spiral banding. Pond at Chislehurst, with *Ranunculus aquatilis*.

11. *L. palustris*, monst. Shell turrited, about ½ inch in length, whorls 5, last whorl more than half length of shell. Pond at Bromley, with type.

12. *L. truncatula*, var. Shell having 3 whitish bands on body whorl, corresponding to 3, 4, and 5, in *H. nemoralis*. Ditch at Bickley, with type.

13. *Sphærium lacustre*, monst. Shell distorted so as to resemble *Pisidium amnicum* in shape. Pond at Bromley, with type.

14. *Cyclostoma elegans*, var. Shell light yellowish, traces of spiral banding on upper whorls. Warlingham, Surrey, with type.

15. *Helix aspersa*, var. Shell having four well-defined bands. Chislehurst Common, amongst *Pteris aquilina*.

16. *Helix aspersa*, var. Shell having upper portion of whorl chocolate colour, described in a former note (p. 91). I find that when the light is allowed to pass through the chocolate coloured portion very faint mottlings become visible, indicating those present in a normal shell.

17. *H. Cantiana*, var. Shell smaller than type, glossy, and semi-transparent, slightly tinged with rufous, especially near the mouth. Lip pinkish. Farnborough, Kent, two specimens.

18. *H. virgata*, var. Shell large, and having one or more interrupted bands. Margate.

19. *H. nemoralis*, monst. Shell much distorted from repair of fracture, umbilicus wide and deep. Chislehurst Common, on *Pteris aquilina*.

20. *Clausilia biplicata*, monst. Mouth of shell oval, and contorted, probably from repair of fracture, channeling of lower part not perceptible. Three well-marked denticles present. Near Hammersmith, with type.

21. *C. laminata*, var. Shell rather tumid, inside of mouth, including denticles, of a purplish-brown colour.

Other varieties are described in former notes.

T. D. A. COCKERELL.

Bedford Park, Chiswick, 1884.

NATURAL HISTORY JOTTINGS.

ON WASPS, CHIEFLY.

As stated in "Natural History Jottings for 1881," in the May issue of SCIENCE-GOSSIP, 1882, the summer of that year, in the neighbourhood of Harnham and Bradford, Northumberland, was remarkable, from a natural-history point of view, in the almost entire absence of the social wasps and humble bees. This I accounted for by the very severe weather prevalent during the second week in June killing off the large females, or queens, with the embryo brood which they would be undoubtedly at that time rearing; as these foundresses of colonies, of both tribes, had been plentiful enough during the latter part of May and commencement of June, and I had already observed the wasps gathering wood fibres for the manufacture of the paper of which they build their nests and combs.* Moreover, during the spell of wintry weather that prevailed from June 6th to 10th inclusive, I had discovered a nest of the moss or carder bee (*Bombus muscorum*), containing a large amorphous cell, or wax-enclosed mass of bee-bread, enclosing six or seven larvæ of varying size from very small to what I took for nearly full-grown, as well as a single elegantly urn-shaped thin wax cell containing a very little clear honey.

The summer of 1883, however, was remarkable for a superabundance of the social wasps, and an abundance of the humble bees. To give an idea of the great plenty of the wasps I may state that I have known of twenty-five nests, or "bikes" (as they are here called), within an area of not more than forty acres of meadow and pasture land, this area being represented by the figure of a square; as well as two more nests a very little outside that square. Within this same area were found three nests of the orange-tailed humble bee (*Bombus lapidaria*), and one of the common humble bee (*B. terrestris*); whilst outside of it, but at no great distance, another nest of each species was found.

Of the above-mentioned twenty-seven nests of the wasps, fifteen belonged to the *Vespa vulgaris*, six to the *V. sylvestris*, five to the *V. rufa*, and one to the *V. Germanica*. In addition to these were two others, small secondary nests of the *V. rufa*, built on the sites of the first nests which had been destroyed.

Premising that I was in the district indicated from the beginning of the fourth week in July until near the close of September;—that the earthen dykes, with their hedgerows and numerous trees, bounding the several fields, were mostly stone-faced to strengthen them against the rutting and butting of the cattle, though with occasional interspaces free from stones; that flies (Diptera) were exceedingly numerous, especially in the lee of the dykes and hedgerows, and fruit abundant; and that the weather during the most of that period was warm, though variable and moist;—I shall give some of my observations, on the wasps chiefly, mostly as they were jotted down and commented on at the moment.

July 25th, 1883.—Wasps are exceedingly numerous; have already seen nearly a dozen nests, or "bikes."

July 30th.—Observe more wasps' nests in the dykes. I have also observed three nests in the level ground in a small meadow, two being those of the *Vespa vulgaris* and one that of the *V. rufa*.

August 2nd.—In the evening, after a very heavy and continuous rainfall, the temperature being then much lowered, three large nests of the *Vespa sylvestris*

* SCIENCE-GOSSIP, May, 1882, pp. 102, 103.

were taken out of an earthen dyke in great part faced with stones. Through the lowering of the temperature, few, if any, of the wasps were on the wing. The three nests were all within a distance of eighty paces, two of them being within only twenty paces of each other. All were built well up in the face of the dyke, and were near the surface; indeed, one of the nests had a goodly segment of it exposed to view; another was not more than an inch within the small hole of entrance; whilst the third was farther back, but was well revealed on removing two of the stones at its entrance, behind which it was situated. These nests were rounded in form, and of the size and nearly of the shape of a large turnip; and were composed of grey and grey-green paper, the layers of the shell being large, thin and numerous. The cells of the comb are made of similar paper to that constituting the shell, or case; and they appear to be built up as the larvæ grow—as needs required. On the larva becoming full-fed it apparently fully lines its cell with white silk, as well as continuing the edges upwards and completely covering the top of the cell with a rounded cap of the same substance, which is tough and strong and greatly increases the strength of the cells, these used cells being again utilised after the emergence of the imagoes. There are both large and small cells filled with pupæ, or nymphs. New and imperfect cells containing larvæ are on the margin of the circular platform of paper cells constituting the comb; and there are ova in many of the formerly used cells, fastened by one end to the side of the cell towards its bottom. The ovum is oblong, curving, white in colour, and of fair size. There are larvæ of all sizes, and pupæ or nymphs in all stages of development to close on hatching: indeed, there were many newly-hatched wasps in the nests when taken. All the three sexes were represented, there being the workers, the large females or queens, and the males or drones with their longer antennæ and slimmer bodies, all three kinds being of large size and bright colours.

August 3rd.—This afternoon I took a small nest of the *Vespa rufa* out of the same dyke as that out of which were last night taken the three nests of the *V. sylvestris*, but on its opposite side, where are also two nests of the *V. vulgaris*. In form it resembles a small turnip on a depressed sphere; and it has the oundish hole of entrance and exit in the centre beneath, and a single circular platform of comb, about two inches in diameter, which is suspended by a broad paper pillar from the top of the shell of the nest. A second pillar, to support a second and lower platform has been formed, being attached to the side of one of the central, used, silk-lined and consequently strong cells; and it has a very rudimentary cell at its extremity, which already contains one of the oblong, milk-white and somewhat curving ova. The outer cells of the platform of comb are very rudimentary, but each contains an ovum; the inner ones contain larvæ of various sizes; whilst, further in, towards the centre, are pupæ or nymphs, and vacated cells which again contain ova, mostly two and three in number, but in some instances even four: some of the cells nearer the circumference, which have not before been used, also contain two ova. The larvæ of this species of wasp are not white, but are yellowish, or buff-coloured. This nest was not far back into the dyke; and the mould was easily dug into, so easily indeed that the nest was got out with a walking-stick. Nearly all the wasps found at it were taken; fifteen in all, seven of which were males, and eight workers. In the evening, however, a few more wasps were taken from the cavity out of which the nest had been dug. These wasps were not at all vicious; the larger ones (*V. sylvestris*) disturbed last night were very vicious. On the following day I took a few more wasps from the nest-cavity, and left yet a few lingering about the place. No queen, however, was observed, only males and workers; had there been one, she would have, in all probability, been in the nest when it was taken. In all there have been not more than thirty wasps belonging to this small nest. Is it not somewhat singular that there should be males at so early a stage of the nest?

In the evening a very large and strong nest of the *Vespa Germanica* was taken out of a stone-faced earthen dyke. On removing two of the stones the nest was fully revealed lying in a cavity behind, its entire depth being distinguishable. The case of this nest is of a shelled character, the several layers of grey and grey-green paper constituting it being laid on in large shell-like pieces varying in dimensions; and, though consisting of fine vegetable fibres, it is thicker in texture than is the paper of the *V. sylvestris* and *V. rufa*. There are six tiers, or platforms, of comb; and the nest is the largest I have yet seen. The ova in the comb are at the bottom of the shallow rudimentary cells at and near the margin of the tier, and down towards the bottom, or only midway in the deeper cells towards and at the centre; and are oblong, a little curving, and milk-white in colour. They are fastened by one end to the side of the cell in an angle and project outwards into an acute angle. There is here mostly only one ovum in each cell, though, in some instances, two and even three ova have been deposited in the deeper cells. There are, as well as ova, larvæ of all sizes, and pupæ or nymphs in all stages of development up to perfection, young wasps emerging from the cells. The very young larvæ are attached to the side of the cell in the same manner and position as are the ova, appearing indeed almost to be simply an outgrowth from the ovum in the anterior or cephalic region,—just as though a head had formed there. As the cells are vertical and mouth downwards, some secure attachment will be absolutely necessary for the suspension and safety of the head-down larvæ. No males were found at this nest, nor the queen (which, probably,

had been destroyed in the burning out of the nest); but there was an immense host of very active and very fierce workers, which freely attacked the would-be destroyers of their home, and it was no light task evading their stings, as they were most persistent in their attacks and would follow one far from their nest.

Also, this evening, a nest of the *Vespa sylvestris*, not quite so large as the three taken on the 2nd inst., but of fair size and the same shape, was taken out of the above-mentioned dyke at no great distance from that of *V. Germanica*. It also was situated in a cavity immediately behind the facing stones of the dyke, being completely exposed on the removal of a few of them that lay in front of it. In it were found all the three sexes, workers, large females and males; and out of one tier of comb I extracted several of the large females, or queens and males, that were just about ready to emerge.

(*To be continued.*)

SCIENCE-GOSSIP.

Death has been very busy lately with scientific men. We have to mourn the loss of two old and valued contributors: Professor Buckman, F.G.S., whose papers on geology and botany were frequent in our earlier numbers, and Mr. J. F. Robinson, of Frodsham, whose "Notes for Science-Classes" were among the last of his contributions to Science-Gossip. Mr. Robinson died at the early age of forty-five, an earnest, simple-minded botanist and naturalist, who was never so pleased as when assisting other students.

Two distinguished geologists have just passed away: Dr. Thomas Wright, of Cheltenham, the well-known authority on British Oolitic fossils, and Mr. R. A. Godwin-Austin, of Guildford, whose papers and researches on the physical geography of various of the geological periods gave a new charm to the science, and also aided in the discovery of many new truths.

Mr. A. T. Metcalfe, F.G.S., has communicated to the Geological Society his discovery in one of the bone caves of the Cresswell Crags of the portion of the upper jaw of the mammoth, containing the first and second milk molar teeth, *in situ*.

The Natural History Collections at the Albany Museum, Graham's Town, have long been known to naturalists, who, however, have not hitherto been aware of their extensive character. A catalogue has now been compiled by the curator, M. Glanville, and presented to both Houses of Parliament by the Governor. It is in every way an admirable and creditable piece of work, and cannot fail to be interesting and helpful, both to naturalists at home and abroad.

The new Executive Council of the National Association of Science and Art Teachers held its first meeting on Saturday, November 29th, in the Technical School, Manchester. Dr. H. C. Sorby, F.R.S., of Sheffield, presided, and there were present representatives from several district associations. Sir Henry E. Roscoe, F.R.S., &c., was unanimously elected president. The new rules adopted at the Annual Meeting were submitted, and ordered to be printed, together with the annual report, an abstract of the proceedings of the district associations, list of members, &c. Measures were adopted for a large extension of the Association, and a committee was appointed to consider the desirability of establishing a newspaper or other journal for science and art teachers. Several other matters were discussed, including a circular of the Science and Art Department, respecting prizes and scholarships, the dates of examinations, and details respecting examinations in machine construction, and drawing and building construction, and in art. It was decided to hold the next meeting of the Executive Council in Birmingham early in February.

A notable man, Professor Voelcker, F.R.S., well known as a writer on agricultural chemistry, has just died at the age of sixty-two.

Dr. H. C. Lang, F.L.S., has drawn up a "Systematic List of the Butterflies of Europe," extracted from his work on this subject. It is published by Messrs. Reeve & Co.

Mr. Charles Baily, F.L.S., has kindly sent us a copy (profusely illustrated) of the resumé of the communications he made to the Leenwenhoek Microscopical Club, and the Manchester Philosophical Society, "On the structure, the occurrence in Lancashire, and the source of the origin of *Naias graminea*, Del. var. *Delilei*, Magnus."

Professor Owen has drawn attention to the fact that the upper molar teeth of an eocene mammal (Neoplagiaulax) from Rheims, has premolars like those of the secondary mammal Plagianlax.

Mr. W. Brockhurst has demonstrated to the Linnean Society, that double daffodil flowers can produce seeds. He has raised them.

The Rev. H. Higgins has published a very thoughtful paper, in which is condensed a good deal of personal experience in the matter, on "Museums of Natural History." He is rather hard on the "loungers" there—but can they "lounge" in better or more harmless places?

Dr. Percy Wilde, of Bath, has issued a short pamphlet entitled "Test Type for Determining the Acuteness of Vision." It will be found of great value to people of failing sight. The paper was originally arranged for the "Medical Annual and Practitioners' Index."

M. POUCHET, who is still engaged in experiments on the subject, states that the blood of cholera victims is charged with biliary salts, whilst there is always a tonic alkaloid in their dejecta. Experiments at Marseilles show that biliary acids are relatively more abundant in the blood of cholera patients than in others.

MR. ELLERY, the well known astronomer of Melbourne, is still of opinion that the recent brilliant sunsets are attributable to the presence of vapour in the higher regions of the atmosphere.

MR. GIBBS BOURNE has found a hydriform stage of the freshwater jelly-fish, which for several years past has made its unaccountable appearance in the tanks in Regent's Park.

"THE Birds of Lancashire," by Mr. F. S. Mitchell, of Clitheroe, will be published shortly by Mr. Van Voorst. The book is a carefully prepared list of the species of birds which, either as residents or visitors, have been known to occur within the limits of the county of Lancaster. The author has been aided with information from observers in all parts of the county, and this, added to published matter, has furnished him with a vast number of facts. A map of Lancashire, showing the physical features, and with all the places referred to inserted, has been specially drawn for the work, as also plans of Martin Mere before it was drained, and of the duck-decoy at Hale, with woodcuts illustrating this mode of catching ducks. The volume promises to be very interesting.

AT the last meeting of the Royal Microscopical Society a new Lantern Microscope with the oxy-hydrogen light was exhibited, which will be of great service to lecturers who require to exhibit microscopic objects to classes or audiences. A number of anatomical and other objects were exhibited on a screen fourteen feet square; and Mr. Lewis Wright, and Messrs. Newton & Co., of Fleet Street, the makers of the instrument, received high commendations for the brilliancy and sharpness with which the details of the subjects were shown. This instrument was also exhibited at the recent meeting of the Quekett Microscopical Society, when the blow-fly's tongue was shown from 6ft. to 14ft. long, and a section of a drone fly's eye was magnified 2500 diameters.

AT a recent meeting of the Academy of Paris, M. Vulpian read a paper on the anæsthetic action of the chlorohydrate of cocaine. So powerful is it that an aqueous solution of 1 part of cocaine and 99 parts of water inserted under the eyelids produces complete insensibility of the conjunctiva and cornea in the human eye.

ON the 14th of November last, I found a sprig of hawthorn in full and fragrant blossom in a hedge near Ipswich. The sprig bore ripe fruit as well as flowers.—*J. E. Taylor.*

MICROSCOPY.

TO CLEAN CLOUDY MOUNTS.—On mounting sections of freshly cut vegetable tissues, they become cloudy. Will any reader suggest a mode of clearing and mounting to prevent this occurring?—*W. H. L.*

STAINING VEGETABLE TISSUES.—A correspondent has drawn our attention to the fact that the paragraph in last month's SCIENCE-GOSSIP under the above heading, by W. F. Pratt, is quoted bodily, *verbatim et literatim*, from Cole's "Methods of Microscopical Research," part xi. for *June* 1884.

THE QUEKETT CLUB.—The Journal of this well known club for November 1884, is as interesting as usual; containing, beside the Committee's report, list of members, &c., the address by the president, Dr. M. C. Cooke, a paper on "A Hydrostatic fine Adjustment," by E. M. Nelson; and a list of objects found on various excursions to Epping Forest, Whitstable, and other places.

THE NORFOLK DIATOMACEÆ.—Mr. F. Kitton, Hon. F.R.M.S., has issued the second series of his "Century," and in every respect it fully maintains the high character earned for the work by the first.

LIVERPOOL MICROSCOPICAL SOCIETY.—The ordinary monthly meeting of this Society was held on 5th December, the president, Mr. Charles Botterill, F.R.M.S., in the chair. Some notes on the "Seed-vessels of *Senecio vulgaris*" were read by Mr. William Oelrichs, F.R. Met. Soc.; special attention being called by him to the minute spiral fibres emitted from the hairs on the surface of the seed-vessels after immersion in water. Another paper was read by Mr. A. T. Smith, junr., on the structure of *Alcyonium digitatum*, the dead man's finger zoophyte. He described the general appearance of the zoophyte during life, both in and out of the water, and afterwards detailed its minute structure as revealed by the microscope—tentacles, thread cells, spicules, &c.

"THE JOURNAL OF MICROSCOPY."—The January issue of this journal shows no falling off in its old vigour, and promises well for the coming year. It contains the address of the President of the Postal Microscopical Society, Mr. C. F. George; together with papers on "A Piece of Hornwrack: Its Inhabitants and Guests," by Arthur J. Pennington, illustrated; "Rambles of a Naturalist near Amberley," by Miss A. M. Charlesworth; and "The Microscope and How to Use it," by V. A. Latham.

DOES THE SPARROW-HAWK ATTACK TOADS?—Referring to this query (p. 215), I believe such an incident to be quite new in the history of the sparrow-hawk; but not uncommon with the kestrel. Is your correspondent certain the bird was not a kestrel?—*H. M., Ipswich.*

ZOOLOGY.

Notes on the Mollusca of Surrey, Sussex, and Kent.—I have lately been on a walking tour, and have collected many uncommon shells in localities which have not yet, as far as I am aware, been recorded. I think that a few of the more interesting will be worth recording now. In the neighbourhood of Addington, in Kent, I found a single specimen of *Helix rotundata*, var. *alba*, and the same variety also turned up later on at Eynsford, where I also got a specimen of *H. pomatia*, thus extending its range well into Kent, in which county I had never before taken it, though I found it very common in Surrey from Caterham to Shiere. About half-way between Reigate and Dorking, *Clausilia Rolphii* was common on a bank on one side of the road, and with it *Cochlicopa tridens*, while close by a stream rather nearer to Reigate we found also the variety *crystallina* and some specimens of *Helix arbustorum*. *Hyalina* (or *Zonites*) *glabra* was very abundant in Surrey, and in some parts of Kent, but we did not meet with a single specimen in Sussex. The following are a few of the localities: West Wickham, Addington, Reigate, Shiere, Paddock Wood, and Eynsford. *H. nitidula* seemed commonest in Kent; *H. cellaria* and *H. crystallina* were well diffused, but *H. fulva* we only found at Haslemere. A few miles to the north-west of Wrotham I found a few specimens of a greenish variety of *H. cellaria*, similar to one found at Maidenhead, which I considered at the time to be *alliarius* var. *viridula*, the specimen being immature, but comparison with the adult specimens now found convinces me that they are identical. *Achatina acicula* we found in two Sussex localities, one being the extreme summit of a high hill, a few miles north of Chichester, and the other a mossy bank at Robertsbridge, where we found several other good shells, such as *Clausilia Rolphii*, which was by no means uncommon, and with it *Cochlicopa tridens*, *Helix arbustorum*, *H. lapicida*, and others. On a wall at Battle we found some specimens of *Clausilia rugosa*, var. *gracilior*, and close by one *C. laminata*. *Helix cartusiana* was found only at one place, a little to the east of Worthing, where my brother, who was with me, got two specimens. We found a large number of other shells, but I have no space to record them at present, and as they are many of them common ones they would be of less interest than the above.—*T. D. A. Cockerell*, *August* 1884.

Capture of Sun-fish.—A fine specimen of the sun-fish (*Orthragoriscus mola*) was captured about four miles off Redcar, Yorks, on September 13th. A party of gentlemen were engaged in shooting sea-birds, when they sighted what they supposed to be the fin of a shark standing out of the water about 18 inches. When within range, the fish was fired at, and immediately after the boatman gaffed with the monster, which was promptly got on board. On the following Monday, Dr. W. Y. Veitch purchased the fish on behalf of the Middlesbro' Museum Committee, and it is now in the hands of the taxidermist. The demensions of the fish were as follows:—From tip to tip of fins, 5 feet. From nose to anal fin, 3 feet 9 inches. From back to belly, 2 feet 3 inches. Weight, after removal of entrails, 9 stone 2 pounds.—*Baker Hudson, Middlesborough.*

Lantern Illustrations in Natural Science.—I should be obliged for information respecting the best means of demonstrating to large classes upon natural history objects with the aid of microscopic slides (not micro-photographs) and lantern. I understand that there is a method by which the image of opaque objects even can be thrown upon the screen. How far can an ordinary microscope and lantern be adapted to such work?—*E. W.*

Scientific Societies, and the Work they are doing.—We have received the Transactions of the Hertfordshire Natural History Society and Field Club, Parts 1 & 2. Amongst the papers therein we notice the following: "The Diatomaceæ, with special reference to species found in the neighbourhood of Hertford," by Isaac Robinson; "The recorded occurrence of land and fresh-water Mollusca in Hertfordshire," by W. D. Roebuck and John W. Taylor; "Remarks on the Land Mollusca, with reference to their investigation in Hertfordshire," by John Hopkinson; "Notes on Mosses, with an outline of a Hertfordshire Moss-Flora," by A. E. Gibbs; "Notes on Birds observed in Hertfordshire," by J. E. Littleboy; "List of Land and Fresh-water Mollusca observed in Hertfordshire," compiled by J. Hopkinson; "Notes on Boulders and Boulder-clay in North Hertfordshire," by H. G. Fordham; "On the Microscopic structure of Boulders found in the North of Hertfordshire," by J. Vincent Elsden; "Notes on Lepidoptera observed near Sandridge," by A. F. Griffith; "Report on Insects observed in Hertfordshire during the year 1883," by F. W. Silvester.

The Transactions of the Ottawa Field Naturalists Club is of great interest, proving the vitality and thoroughness of scientific investigation amongst our Canadian neighbours. Besides the inaugural address of the president, Dr. H. Beaumont Small, and the various official reports of the different sections of Geology, Conchology, etc., the following valuable papers are given: "Notes on the 'Flora Ottawensis,'" by Jas. Fletcher; "On the Sand Plains of the Upper Ottawa," by E. Odlum; "List of Ottawa Fossils," with introduction, by Henry M. Ami; "Edible and Poisonous Fungi," by J. Macoum; "List of Ottawa Coleoptera," with introduction, by W. H. Harrington; "Suctoria," by J. B. Tyrrell; "On the occurrence of Phosphate in Nature," by

G. M. Dawson; "The Deer of the Ottawa Valley," by W. P. Lett; and a "Note on *Doassansia occulta*," by W. G. Farlow.

THE Report of the Liverpool Science Student's Association is mainly occupied with accounts of the various excursions made by the members during the past session, many of which are of considerable interest. Amongst these we notice more especially visits paid to Boston Observatory, and to the Seacombe Phospho-Guano Works.

THERE is also, as an Appendix, a valuable series of "Local Notes for Science Students," by Osmond W. Jeffs.

THE Report of the Norwich Science Gossip Club contains, beside the list of members, Report of the Committee, &c., the address of the president, Mr. T. Irwin Dixon, which conveniently summarizes the proceedings of the Society during the past year, briefly describing the various meetings, and giving in condensed form many valuable papers and addresses delivered by members.

THE Proceedings of the Folkestone Natural History Society contains the following papers: "The Hand, considered as an organ of expression; or, Scientific Chirognomy as opposed to Chiromancy," by Dr. FitzGerald, the president; "Pain," by Dr. Tyson; "The Nautilus and the Ammonite," by Mr. Hy. Ullyett, the secretary; "Earthquakes and Volcanoes," Dr. FitzGerald; and a most useful paper, intended as a general guide to the amateur naturalist, read by the Secretary at the field day at Lydden Spont.

BOTANY.

SAGITTARIA SAGITTIFOLIA.—Cette particularité de végétation n'est point signalée dans la plupart des ouvrages de botanique, ou les flores que j'ai à ma disposition; cependant Cosson et Germain de St. Pierre, dans leur "Flore des Environs de Paris," s'expriment en ces termes (page 640): "Souches à fibres nombreuses, émettant plusieurs rhizomes qui portent une ou plusieurs écailles espacées et se renflent au sommet en une bulbe charnue qui devient libre par la destruction du rhizome et donne naissance à une nouvelle plante l'année suivante." J'ajouterai qu'il m'est souvent arrivé de recueillir des échantillons des bulbes en question, flottant dans le fleuve la Somme, à Amiens, soit que ces bulbes se soient eux-mêmes détachées de la base, soit qu'ils en aient été arrachées par le passage des bateaux ou par les travaux de *faucardage* (coupe des herbes aquatiques avec une faux).—*C. C., Somme.*

PARASITIC FUNGI.—Professor Trelease sends us a copy of his carefully drawn up pamphlet, entitled "Preliminary List of Wisconsin Parasitic Fungi." It includes only species which have been examined by himself, and, with one or two exceptions, all are in his own herbarium. The list includes about 270 species, and about the same number of "hosts;" but he thinks their number will be doubled by a few years' collections.

"THE BRITISH MOSS FLORA."—The author of this beautiful and valuable work, Dr. Braithwaite, F.L.S., has now reached his eighth part, which deals with the family *Tortulaceæ*. It is illustrated by six plates, each giving from eight to ten species, with details of structure, &c. This is unquestionably the most valuable work on mosses which has yet appeared.

LEAF OF NEPETA GLECHOMA.—Every observer will have noticed that the leaves of the ground ivy have a tendency to become patched with white, thereby assuming a pretty variegated appearance. Has anything been written on this subject? I have examined several leaves under a strong 1-inch power, and find that the white spots show heaps of black refuse, which looks like excrement from some small insect that has been feeding on the leaf, while there are proofs that the chlorophyll has been consumed. I have, however, failed as yet to detect either insect or fungus, and should be glad to know whether the cause of this peculiarity has yet been traced.—*H. Friend.*

DOUBLE DAHLIAS.—It was not until this summer that I ever observed two dahlias upon one peduncle, back to back, or otherwise. It is evidently due to the economy of nature to utilise one peduncle for two flowers. The "freak" could not have arisen from the want of light; for my plant, also old-fashioned double dark red, was exposed to ample, being in a good upright position. I thought at first one flower, in its struggle for existence, would outdo the other; but no, both were beautifully developed and remained in bloom as long as any other. Last spring I was presented with a primrose (*Primula vulgaris*) suffering from the same abnormality; in this latter case the peduncle was much thickened and flattened.—*R. H. Wellington.*

GEOLOGY, &c.

GEOLOGISTS' ASSOCIATION.—The Proceedings of the Geologists' Association is to hand, containing, besides reports of the ordinary meetings, papers of great interest by members, among which are the following: "Fossil Plants," by J. Starkie Gardner; "Notes on the Krakatoa Eruption," by Grenville J. Cole; "The Implementiferous Gravel of North-East London," by J. E. Greenhill; and an address on "Fossil Plants from various Formations," by William Fawcett. Exceedingly interesting, too, are the reports of visits paid by the Society to the British

Museum (Natural History), and to the British Museum, Bloomsbury. On the former occasion, an address was presented by the president, Dr. Henry Hicks, on behalf of the members, to Sir Richard Owen, on his retirement from the directorship of that institution. A valuable address was then given by Dr. Henry Woodward, on Fossil Fishes. The visit to the British Museum was the occasion of "a demonstration" on the marbles and monumental stones, illustrated by the collection in the Museum.

A NEW DEPOSIT OF PLIOCENE AGE AT ST. ERTH, FIFTEEN MILES EAST OF THE LAND'S END, CORNWALL.—A valuable addition to British geology has just been made by Mr. Searles Wood, in a communication to the Geological Society. The deposit described occurs about five miles north-east of Penzance, and consists of a tenacious blue clay with shells, resting on sand. Mr. Wood has got together upwards of forty species of mollusca, inclusive of a few of which only fragments have as yet occurred, and of several minute species. Among these, besides some that are apparently altogether new, are some particularly characteristic species of the Red Crag not known living, such as *Cypræa* (*Trivia*) *avellana*, Sow.; *Melampus pyramidalis*, Sow.; and *Nassa granulata*, Sow. (or else *N. granifera*, Dujardin), as well as other characteristic Crag species that still live, but not north of the coast of Spain, such as *Turritella triplicata*, Brocchi (*T. incrassata*, Sow.), and *Ringicula buccinea*, Brocchi. The most interesting feature of the fauna, however, consists in the six species of Nassa that the deposit has hitherto yielded, of which all but one, *N. granulata* Sow. (or *granifera*, Dujardin), are unknown from any formation of Northern Europe, and occur, whether in the living or fossil state, only in the southern half of Europe. *N. conglobata*, a species of a group near to that of *mutabilis*, has occurred in the Red Crag; but, so far as the author is aware, neither that shell, nor any of the group to which it belongs, has occurred in any other formation of Northern Europe. One of these is *Nassa mutabilis*, Linné, which now lives throughout the Mediterranean, but outside that sea north of Cadiz (lat. 36° 30′); and two others are new species of this exclusively southern *mutabilis* group. Another seems to be a rare Italian Upper-Pliocene species of the *reticulata* group, *N. reticostata*, Bellardi; while the sixth is the Lower Pliocene and Upper-Miocene species, *N. serrata*, Brocchi. This shell, in the variety of form it presents at St. Erth (where it is one of the most frequent shells), seems to connect the Red-Crag *N. reticosa*, Sow., with the Italian *N. serrata*, while the shorter forms of it are identical with the Italian Lower-Pliocene *N. emiliana*, Mayer. The fauna is altogether southern, no exclusively Arctic shell having as yet occurred in it. Mr. Wood regards the bed as clearly Pliocene, and inclines to the opinion that it is rather Newer than Older Pliocene; that is to say, it is coeval with the Red Crag, but its affinities are more with the Pliocene of Italy than with the Pliocene of the North Sea region; and this seems to show that during its deposition there was no communication between the Atlantic and the North Sea, except round the North of Britain, the refrigeration of the water by the nine degrees of latitude, through which Britain extends northwards from St. Erth, preventing the access on he Italian group of Nassa to that sea.

FLINT HUNTING.—REMARKABLE "FINDS."—During the closing days of November 1884, a party of geologists, one lady and five gentlemen, under the leadership of Mr. R. Law, of Walsden, paid a visit to the flint deposits, on Midgely Moor, overlooking Mytholmroyd village, and about five miles from Halifax. On arriving at the place (a bare patch of about an acre, from which the peat has been denuded, exposing a bed of silver sand and angular stones, capping flagstones of the second millstone grit rocks, and near to which is a circular embankment of earth, marked on the ordinance maps as a Roman mound or remains of a Roman camp). The party made a vigilant search for about two hours, and were rewarded by finding about forty specimens of flint. Besides numerous chips and flakes, from 1 to 2 inches long, and two or three chert and flint cores, a beautiful flint arrow-head, well worked round the edge but broken at the point, a scraper showing marks of having been used, a rhomboidal flint was found; also a very rare specimen of flint thought to have been used for carving on horns, &c., by the ancient flint makers. If valued by the scarcity, such instruments were worth a few pounds at least. The party decided to pay another and an early visit, hoping to find a barbed arrow-head, similar to what has on a former occasion been found here.—*J. Fielding*, *Mytholmroyd, Yorkshire.*

NOTES AND QUERIES.

LIFE HISTORY OF MANTIS.—The mantis belongs to the one carnivorous family of the orthoptera, namely, the mantidæ. The mantidæ inhabit the hot parts of Europe and the tropics; one species, the *Mantis religiosa*, is especially common in the south of France, coming as far north as Fontainebleau. Its name is derived from μάντις, *a prophet*, because of its reverential attitude whilst waiting for a victim. It rears itself on its four hind legs, the thorax being almost perpendicular, and the fore arms extended, and thus remains motionless, except that its head turns from side to side, until some unfortunate insect comes by, when it is seized and devoured. The mantis lays its eggs at the end of the summer in rounded fragile capsules attached to the branches of trees, but they do not hatch till the following summer. When it leaves the egg the young one resembles its parents; differing only in size, and in having no wings. After moulting four or five times it has almost reached its full growth, and its wings begin

to appear under a sort of membrane. This is a pupa state. A final moulting sets free the wings also, and the insect is now perfect.—*Dunley Owen, B.Sc.*

Phosphorescent Insects.—I venture to send an additional circumstance which seems to explain the phenomenon described in November Science-Gossip. I saw the other evening, on my gravel-walk, a bright light, which I found to proceed from a centipede, which was being violently attacked by a beetle, apparently *Steropus madidus*. The latter kept pouncing on its victim, and biting it with fury, and the beetle itself, as well as the gravel around, was covered with the luminous matter from the centipede, so that its form was distinct, in spite of the darkness. I brought the centipede indoors, and it seemed injured. It seemed to me to be unusually luminous, from the excitement it was in from the assaults of this carnivorous beetle.—*John C. Scudamore, Norfolk.*

Water Voles.—To substantiate my conjecture as to the carnivorous habits of water voles, I may mention that it was on the 5th of February, 1884, that I found the shells in their runs, and amongst them was a quantity of recent excrement of some small animal. With regard to Mr. J. A. Wheldon's suggestion, that it might have been done by common rats, I believe they only frequent the water during the summer time. There is no building of any kind, I should think, within a mile of the spot where the shells were found, and although I am often walking by the side of this canal, I have never seen a common rat there.—*F. H. Parrott, Aylesbury.*

Mildness of the Season at Arundel.—While taking a long walk in Arundel Park on Sunday, November 23rd, I observed several new shoots on the lime-tree, with their leaf buds expanding, and in three or four instances fully developed. A few days a friend of mine noticed some new shoots on the oak tree. These shoots must owe their early development to the then mildness of weather at the time of their evolution. Primroses have been gathered here quite a month ago.—*A. W. Fry.*

Large Unios and Anodons in Nottinghamshire.—Mr. Harmer's note concerning the *Unio pictorum*, 4 $\frac{13}{16}$ in., will, I have no doubt, be answered by Mr. Tuxford himself. I will only say that I have collected some from the same locality, as large and larger than the size mentioned. So far as there is any doubt as to their being Unios, I can only say that after fifteen years' collecting, neither Mr. Tuxford nor myself would be likely to mistake the species. Mr. Harmer mentions large anodons, 6$\frac{1}{3}$ in. I took, a month since, at Sutton in Ashfield, in this county, some 300 specimens of *A. cygnea*, 150 of which measure more than 6$\frac{1}{4}$ in. One specimen measures 7$\frac{1}{6}$ in., two more 7 in., 30 between 6$\frac{3}{4}$ in. and 7 in. and 50 or 60 between 6$\frac{1}{2}$ and 6$\frac{3}{4}$. These are the largest I have ever seen, but the species has been found much larger (see old numbers of Science-Gossip). Specimens have been taken at Southampton, measuring 8$\frac{1}{4}$ in., and in one case as much as 9 in. At Worthing, also, very large ones have been obtained, measuring 7$\frac{1}{2}$ in. and 8 in. Should Mr. Harmer be desirous of seeing a specimen, I shall be pleased to send him a 6$\frac{3}{4}$ in. *A cygnea*, if he will send me his address (see exchange column for my own).—*Chas. T. Musson.*

Large Unios and Anodons.—Since writing my note respecting the large shells in Ossington Lake, I have paid another visit to that locality. I was pleased to find that one portion where the shells were very plentiful had been untouched by the workmen; here I gathered many large specimens of *Unio pictorum*, several exceeding five inches in length, the largest measuring 5$\frac{3}{16}$ inches. I also obtained many examples of *Anodon cygneus*, the largest having a length of 6$\frac{5}{8}$ inches. In respect to Mr. E. G. Harmer's note, I must remark that I never saw an *Anodon cygneus* which I should consider "a very similar looking shell" to *Unio pictorum*, nor, in fact, one that even bore a remote resemblance to any of the anodons. If Mr. Harmer has any such variety of this species, I shall be very pleased to make an exchange of shells with him.—*W. Gain, Tuxford, Newark.*

Bats.—A note appears in your December number *re* bats flying during the winter months. It is possible that they do so, and I should say the reason was, mild weather during the time they were observed. I have noted that some hybernating animals seem to sufier, owing to partially renewed activity through mild winters, more than they would naturally do through a cold one. The warm weather, when no suitable food exists, must cause a waste of tissue, which cannot be replaced until the following spring, hence hybernating creatures such as the bat, grass snake, common lizard, &c., would present a more attenuated appearance in the spring following a mild winter, than if the winter had been cold, and thus inducive to complete torpor. I have observed this with respect to the grass-snake, but not yet with the bat. However, I have one now under observation, which is hybernating in a bird cage, and I notice it is rather restless on a warm night.—*F. W. Halfpenny.*

Camel.—A dromedary is a camel, but a camel is not a dromedary. This I learned to recognise in repeated travels in Egypt and Asia Minor. The dromedary, as its name implies, is a swift animal, and bears the same relation to the camel as the fast trotting-horse does to the cart-horse, or pack-horse—these last being strong, heavy and slow. The dromedary is credited with trotting about twenty miles an hour—the torture of such a trot to one unaccustomed to it is fearful. An Arab bearer of despatches will keep up the pace for hours together. A well-bred, well-trained dromedary—for there are great differences—is valuable. A regular camel or burden-bearer cannot be forced more than some four or five miles an hour. Having ridden these day after day across the desert, I can say the movement caused by the long swinging sort of walk—though not painful to the rider, causes great fatigue till he learns to accommodate his back-bone to the motion of the animal. The Egyptian camel then and dromedary have respectively one hump, and a camel judge estimates an animal by the plumpness of this storehouse of fat. I never saw a "Bactrian" or two-humped camel, till I was east of the Crimea.—*John Anthony, M.D., F.R.M.S.*

Irish Pearls.—In the muddy banks of the tidal river Blackwater, Waterford, buried to the depth of some inches, is found a shell-fish, commonly known as the sugar-loom, and which are used as bait for fishing. In some of these shells have been lately found a number of pearls, the finders of which looked upon them as no value, the shell fish being only looked for as bait. A few days ago a gentleman encountered a young lad who had several of these pearls in his pocket, and one of these having been sent to an expert has been valued at £5, and there is no doubt but that a large number of pearls of considerable value are lying covered in the mud of the river.—*J. Graves.*

"PECULIAR HAILSTONES."—In "Nature," vol. xv., at page 163, your correspondent, Alex. Johnstone, F.R.S.S.A. (in the last number of SCIENCE-GOSSIP), will find, I think, a satisfactory answer to his enquiries regarding hailstones. The article in question is an abstract, with illustrations, of a paper "On the Manner in which Raindrops and Hailstones are formed," by Professor Osborde Reynolds, M.A., in which the author endeavours by theory and experiment to explain the true nature and mode of formation of these productions.—*J. A. Osborne, M.D., Milford Letterkenny.*

HAILSTONES.—About nine or ten years ago I observed that the form of hailstones was altogether different to what I had in my earlier days been taught to assume. I had always been under the impression that they were spherical, in fact, minute blocks of ice—frozen rain drops. On the occasion of my enlightenment, I was in a field when a heavy hailstorm took place. This admitted of my seeing more perfect specimens than if I had been in the street, or on a public highway, as there was less probability of their being broken in their fall. The enormous size of the stones first attracted attention, but upon examining them, it was also found that they were conical with a smoothish rounded base. The sides of the cone were striated towards the apex. Many of the cones had broken apices, but sufficient was left to indicate their complete form. Those which were perfect began to melt first at their apex, the portion last to melt being the rounded base. It is believed that this peculiar form is due to the nucleus (a frozen ice particle) passing from the upper portion of a frozen cloud or fog. In its descent it overtakes and adds to itself other ice particles, these form the originating elements of the hailstone. By continued accumulation of particle and pressure on the edges of the base, they begin to round, until eventually it partly turns over and forms the commencement of the cone which is a rapid process. There is much assumption in this theory, but there is evidence of its practicability from the smoothness of the base, the striæ of its sides, its conical shape and the melting of the apex (the last formed part) before other portions. The firmness of the hailstone is proportionate to its size. The larger, the firmer, and the harder its base is to its apex, the larger, the heavier, and the greater the speed it will travel through the cloud. The size to some extent infers the depth or density of the cloud through which it has passed, perhaps both. The conical shape of the hailstone is well known, having been seen by other observers. Since first seeing it I have often pointed its shape.—*Matt. Hedley, F.R.C.V.S.*

THE CORIXA IN THE AQUARIUM.—This insect forms a very handsome and interesting object of an aquarium. It is closely allied to the water boat-fly (*Notonecta glauca*), and is very abundant in our ditches; in fact much more so than the latter. I have several in my aquarium, and they are literally the life of it. I caught them from the bridged-over part of a ditch, when fishing for minnows and sticklebacks, and where the water is nearly in darkness. This suggests that they are fond of dark nooks. Unlike its relation the boat-fly, it swims with its back uppermost as do other aquatic insects. Its longest pair of legs are not the last as in the boat-fly, but the middle. It is so eccentric in its habits, that its actions often provoke mirth. I have closely studied it for some time past, and find that it frequently has to rise to the surface for a fresh supply of air which it does by a series of vigorous darts, and when it has obtained that supply, it regains the bottom by still more vigorous darts, in consequence of its increased buoyancy. So great is its buoyancy when charged with air that I have seen one raise to the surface a dead stickleback which must have weighed more than ten times the weight of the corixa. When it has descended to the bottom (a task which is only performed with the greatest of difficulty, judging from the zig-zag course the insect is compelled to pursue) it clings to the nearest stone or pebble, and stretches out its two flattened elongated legs, and remains in this peculiar position for some time. I am of opinion that the function which these members now perform is analogous to that performed by the poisers of a fly, viz. to balance the insect. After it has remained in this position for some time it performs a number of very comical spasmodic movements by quickly passing its two oar-like legs over its back, and as quickly withdrawing them. To the ordinary observer, this is done by the insect, probably for mere pleasure. A close observer, however, detects in these very peculiar motions an object. This object is nothing less than to break up and set free parts of its air-bubble which most likely the insect finds renders its body too light. Its under surface where the air-bubble is, looks like a globule of quicksilver. The facility with which it bends its legs in almost any direction is very striking (I mean its middle pair). I think its food consists of the disintegrated particles of algæ, which I have in the aquarium, and which by some means or other have become separated from their respective plants. Should my surmise prove correct, then the corixa will not only be found a pretty and interesting object of the aquarium, but also a useful member of it.—*Arthur Ayling.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

W. WHITE.—Apparently your nuts belong to Juglandaceæ, and are probably *Carya amara* or *porcina*.

E. LAMPLUGH (Hull).—You cannot do better than obtain Dr. Cathcart's new ether microtome, manufactured by Mr. Charles Coppock, 100 New Bond Street, to whom write for its "illustrated description."

A. L.—For life-history of, and experiments on the common liver-fluke, see paper by Professor Thomas in "Quarterly Journal of Microscopical Science" for 1882. A good popular paper on the subject was also written by Mr. George Dowker, F.G.S., of Canterbury, a few years ago. A good description of the earthworm will be found in one of the volumes of "Science for All."

R. H. W.—You will find a good account of Stonehenge in the Guide to that place, to be obtained at Salisbury railway-station; or a longer one in Ferguson's "Rude Stone Monuments in Great Britain"; for an account of bone caves, see Professor Boyd Dawkins' work on "Cave Hunting." Dr. Hicks' address on "Bone Caves," will doubtless be published in the Transactions of the Society.

E. E. TURNER (Dublin).—Get Thome's "Botany," edited by A. W. Bennett, and published by Longmans. It will exactly meet your wants.

R. C.—We do not recognise the specimens forwarded to us. Please send fuller details.

BALLYWILLIAM.—You will find a good account of the *Eucalyptus* in the "Treasury of Botany." It has been planted in Italy in order to drain the marshes. Its leaves give off a great deal of moisture. The Eucalyptus is sensitive to frost, and will not prosper where the nights are frosty.

A. Shaw.—We do not undertake to name foreign specimens of natural history. The objects shall be sought up and returned to you. You will find Chenu's "Conchyliologie," of help in naming your specimens.

H. W. S. W. B.—The best diagrams for botanical class lectures are those of Professor Henslow's (drawn by W. Fitch), issued, we believe, under the direction of the South Kensington authorities.

S. C. Cockerell.—There is, or was, a useful list of British shells published by Messrs. Mardon, Son & Hall, of St. Stephen Street, Bristol, compiled from Dr. J. Gwyn-Jeffreys' "British Conchology," by Mr. H. K. Jordan, F.G.S. The first part (1866), one shilling, contains all the land and freshwater species, and the marine as far as Littorinidæ. The second part (1870), one shilling and sixpence, from Rissoa to the end of the work. No doubt the publishers would give Mr. Cockerell information about it.—G. S. T.

EXCHANGES.

Rare British plants offered for British or foreign Spargania. *S. ramosum*, only if in ripe fruit.—Beeby, 14 Ridinghouse Street, London, W.

Wanted, Sach's "Botany," latest English edition, Macmillan's. Exchange, Watson's "Theological Dictionary," 1068 pages, and Wesley's "Sermons," 2 large vols., or offers.—J. Wallis, 50 High Street, Deal.

A few well-mounted sections of human teeth, showing dental exostosis, in exchange for other well-mounted slides.—Charles Arnold, L.D.S., 8 St. John's Villas, New Southgate.

Wanted, a turntable, also live box for microscope; exchange books, &c.—P., 4 Merridale Lane, Wolverhampton.

Pupæ of Myricæ and sea-birds' eggs in exchange for Lepidoptera or other eggs: also wanted, fresh killed specimens, for stuffing, of barn owl, kingfisher, hawfinch, and goldfinch. Give cash or exchange.—R. McAldowie, 12 St. Nicholas Street, Aberdeen.

Wanted, in exchange for set of diaphragms for photographic lens, dissecting-knives, live box, or mounted and unmounted objects; unaccepted offers not answered.—J. W. W., 445 Shoreham Street, Sheffield.

Wanted, butterflies and live bat (long-eared) in exchange for fifteen monthly parts of Routledge's "Every Boy's Magazine" for 1878 and part of 1879, and twelve numbers of "Photographic News," 1884. Unaccepted offers not answered.—J. W. W., 455 Shoreham Street, Sheffield.

Wanted, the numbers of Science-Gossip from No. 1 to end of 1872, also from beginning of 1880 to end of 1883, bound or unbound, separate numbers preferable, all clean; will give microscopic slides in exchange, or apparatus and materials.—Lists from J. J. Andrew, L.D.S.Eng., 2 Belgravia, Belfast.

Offered, 50-inch bicycle, with fittings; wanted, centre fire breech-loading gun.—Albert Newton, 24 Ryecroft Place, Ashton-under-Lyne.

Well-blown eggs of British and American birds for exchange.—Dr. J. T. T. Reed, Ryhope, near Sunderland.

A few choice specimens of *Anodonta cygnea*, from $6\frac{1}{4}$ to $6\frac{15}{16}$. Desiderata numerous, *Vertigos*, *Clausilia Rolphii*, &c., named varieties. Correspondence invited.—Charles T. Musson, 1 Clinton Terrace, Derby Road, Nottingham.

Wanted, to purchase secondhand copy of Jeffrey's "British Conchology."—C. W. White, 2 Woodrow Circus, Pollokshield, Glasgow.

Wanted, any species of Naiades from Asia, Africa, South America, and Australia, New Zealand, or any of the East India islands. For these either liberal exchanges or cash will be given. The attention of collectors and dealers, as well as scientific societies, is especially directed to this exchange.—A. G. Witherby, Cincinnati, Ohio, U.S.A.

Wanted, bull's-eye condenser polariscope, 2 inch objective, all of best make, for Ross' binocular. Will give copies of "Flowers and Flower Lore," 1st edition, in 2 vols., £1 1s., Chinese coins, or cash.—Rev. Hilderic Friend, F.L.S., Worksop.

Will give "Flowers and Flower Lore" in exchange for a good series of micro slides, sections of insects, micro fungi, or foraminifera preferred.—H. Friend, Worksop.

Foraminifera material (good) wanted in exchange for well-mounted slides of horn and hoof sections, selected foraminifera, &c.—A. C. Tipple, 35 Alexander Road, Upper Holloway, N.

Wanted, fossils from upper miocene, middle eocene of France, upper miocene of Belgium and Germany, Solenhfen stone; also land shells from Philippine Islands and Madagascar. Offered, other fossils and shells.—Miss Linter, Arragon Close, Richmond Road, Twickenham.

A large lot of botanical books, &c., in exchange for natural history text-books. Desiderata, a few dozens of fine botanical micro slides for first-class mounts only, or for rocks and minerals. J. Harbord Lewis, F.L.S., 145 Windsor Street, Liverpool, S.

Well-mounted slides of insects in exchange for micro photographs, diatoms, or foraminifera. Send list.—J. Boggust, Alton, Hants.

Wanted, collections of wild flowers and plants, or micro slides, books on natural history subjects, in exchange for violin.—J. W. Whitehead, 10 Seedley Park Road, Pendleton, Manchester.

Wanted, adult specimen of mole cricket (*Gryllotalpa vulgaris*). Young adder (alive), or other exchange offered.—F. W. Halfpenny, 2 Fern Villas, Park Road, West Ham, Essex.

Wanted, a violin, bow, and case; Beattie's "Castles of England and Wales;" C. R. Leslie's "Handbook for Young Painters," or any other work on painting, in exchange for well-rooted plants of exotic ferns, blooming greenhouse plants, and fine varieties of the Cactus tribe, or British land and freshwater shells, or British Lepidoptera and fossils.—F. R. E., 82 Abbey Street. Faversham.

Wanted, Cratægi, Hyale, Cinxia, Athalia, Semele, Rubi, Betulæ, Agestis, Alsus, Argiolus, Comma, Actæon, Elpenor, Fuciformis, Villica, Aprilina, Festucæ. Duplicates: Paphia, Selene, Cardui, Galathea, Cervinaria, Vetulata, Illunaria, Pudibunda, Viminalis, Flavocincta, Trapezina, Persicaria, Ocellatus, Tiliæ.—J. Bates, 10 Orchard Terrace, Wellingborough.

Wanted, Charles II. half crown for "Boy's Own Papers," or James I. shilling for other books.—John T. Millie, Clarence House, Inverkeithing.

Wanted, good material for mounting, more especially insects (in spirit); also a quantity of any one insect (providing it is not common); well-mounted slides given in exchange.—C. Collins, 25 St. Mary's Road, Harlesden, N.W.

Tran-section of stem of *Helianthus annuus*, double-stained, in exchange for other good slide; diatoms specially desired; send list. Other slides to exchange and unmounted material. Offers to—P. Kilgour, 163 Dallfield Walk, Dundee, N.B.

Wanted, Science-Gossip for January and February, 1884; will give 6*d*. each, and pay postage, if clean copies.—J. R. Hewitson, The Knowle, Mirfield, Yorks.

Wanted, material for micro-mounting, the following most desired: micro fungi, eggs of insects (especially those of parasites), whole insects (preserved in spirit for dissection), or foraminifera; will give in exchange valentines, knife, or good mounted objects.—William H. Pratt, 15 Gill Street, Nottingham.

Wanted, paraboloid or Webster condenser; good field-glass or induction-coil offered.—S. C. L., 276 Middleton Road, Oldham.

Wanted, British beetles; will exchange British beetles, lepidoptera, shells, fossils, &c. Send lists of duplicates and desiderata.—Delancey Dods, 47 Chepstow Place, Westbourne Grove, W.

I should be glad to correspond with a Coleopterist in one of the midland or northern counties with a view to the exchange of specimens during the forthcoming entomological season. I desire to exchange fresh and well-set specimens of Lepidoptera for Coleoptera in a similar condition.—Address: W. J. V. Vandenbergh, Esq., F.R.A.S., F.M.S., &c., 5 Yale Terrace, Leytonstone, Essex.

BOOKS, ETC., RECEIVED.

"Universe of Suns," by R. A. Proctor. London: Chatto & Windus.—"Geology of Weymouth," by R. Damon. London: Standford.—"Natural History Sketches among the Carnivora," by Arthur Nicols. London: L. Upcott Gill.—"Aids to Long Life," by N. E. Davies. London: Chatto & Windus.—"The Speaking Parrots, a Scientific Manual," by Dr. Karl Russ. London: L. Upcott Gill.—"Rabbits for Exhibition, &c.," by R. O. Edwards. London: Sonnenschein & Co.—"Bibliography and Index to Climate," by A. Ramsay. London: Sonnenschein & Co.—"Edible British Molluscs," by M. S. Lovell. London: L. Reeve & Co.—"The Naturalist's World," by Percy Lund. Vol. for 1884. Sonnenschein & Co.—"The Disk, a Prophetic Revelation," by E. A. Robinson and G. A. Wall. London: Griffith, Farran, Okeden & Welsh.—"Annual Report of the Metropolitan Public Gardens, &c., Association."—"Scientific Romances, No. 1. What is the Fourth Dimension?" by C. H. Hinton, B.A. London: Sonnenschein & Co.—"Book Lore," No. 1.—"Journal of Conchology."—"The Gentleman's Magazine."—"Belgravia."—"The Journal of Microscopy."—"The Science Monthly."—"Midland Naturalist."—"Ben Brierley's Journal."—"Science."—"American Naturalist."—"The Electrician and Electrical Engineer."—"American Monthly Microscopical Journal."—"Popular Science News."—"The Botanical Gazette."—"Revue de Botanique."—"La Feuille des Jeunes Naturalistes."—"Le Monde de la Science."—"Cosmos, les Mondes." &c. &c. &c.

Communications received up to 13th ult. from:—R. S.—A. S.—M. G.—J. C. M.—J. C. S.—C. W. W.—Dr. J. F.—A. R. W.—G. T.—S. A. B.—W. D.—A. G. W.—A. E. P.—J. B. B.—S. F.—R. McA.—J. W. W.—E. D.—E. A. W.—J. J. A.—A. N.—Dr. J. T. T. R.—W. H. L.—J. W.—A. W. F.—T. B., jun.—F. H. P.—F. E. C.—C. T. M.—C. A.—A. N. T.—W. B.—L. E. A.—H. F.—J. T. M.—C. C.—C. P.—J. B.—C. R. F.—J. A.—J. W. H.—R. H. W.—J. W. W.—J. B. (Wellingborough)—J. H. L.—C. C.—E. E. T.—W. G.—J. E. L.—H. W. S. W. B.—G. S. T.—J. W. G.—A. C. T.—P. K.—Dr. A. D.—W. W.—W.—C. P.—H. F.—G. S. T.—Dr. H. W. S. W. B.—F. K.—A. W. L.—J. G.—D. D.—D. S.—A. D. W.—A. A.—J. R. H.—M. H.—S. C. L.—W. O.—J. P. W.—M. J. H.—A. U.—W. H. P.—Dr. J. A. O.—A. A.—W. J. V. V.—R. C.—&c. &c. &c.

E.T.D. del, ad nat. Vincent Brooks, Day & Son lith.

TOE OF MOUSE, INJECTED.

× 30.

GRAPHIC MICROSCOPY.

By E. T. D.

No. 14.—Toe of Mouse, Injected.

THIS subject explains itself, revealing a distribution of blood vessels, in a transparent section of the toe of a mouse. The skill required to successfully inject the vessels, and afterwards procure so delicate a scission, is essentially the province of the professional preparer; but, the object is sufficiently "popular," to be purchasable, and is found in most collections of microscopic objects. Although not approaching the stern requirements of the biologist or anatomical student, as revealing disentanglement of delicate tissues, or isolation of determinate structure, it is eminently a valuable educational or class preparation, as exhibiting conditions of distinct parts seldom found, in one view so intimately or compactly associated. The drawing was made from a "happy" cut, just cleaving, without injuring or disturbing, the tarsal bones, showing them in perfect integrity, surrounded by minute blood vessels spreading from the digital artery, and continuing to the capillary loops terminating in the papillæ of the thick, but highly sensitive, and vascular epidermic cushion under the surface of the claw, the matrix of which is seen, penetrated with minute blood vessels. Elegant and instructive as this preparation may be, as a microscopic exhibit, it is as nothing compared to such a condition in a living state, with the blood coursing through the vessels; the web of a frog's foot, the branchiæ and transparent parts of a tadpole, the fins and tail of minnows, many of the larvæ of water insects, and, *par excellence*, the yolk bag of freshly hatched fish, may be, by well-known methods, arranged, and disclose on the stage of the microscope, exhibitions of energetic life, in the circulation of the blood, of the deepest and most impressionable significance.

Addendum. *Eylaïs extendens:* In the January article on this subject, it was stated that the comely rotundity of the Hydrachnæ rendered them difficult to preserve, as permanent specimens for the cabinet, except at the sacrifice of their shapeliness, the dilemma being to find a medium of just the density needed to preserve the integuments from wrinkling or collapse. The writer has since received, through the courtesy of Mr. Henry Francis, the President of the Bristol Microscopical Society, a specimen *en permanence*, mounted three years ago: enclosed in a deep circular cell. The medium Mr. Francis used is a mixture of eight parts of distilled water (just tainted with carbolic acid), to one part of pure glycerine; under severe examination, although a little "off colour," its characteristic plumpness is perfectly intact, and such important features as the curious ocelli, the palpi, the parts about the mouth and the genital plates, are so well preserved and displayed, as to bear scrutiny under the highest reaching powers.

Crouch End.

Bats.—A correspondent in the December issue tells us he has often seen bats flying about the streets of Maidstone in mild weather during the autumn and winter months. This reminds me of what I saw in Paris on the first Sunday in January 1871. During the service in the church of St. Roch, I saw several bats flying about in the church between three and four in the afternoon. Afterwards in the evening twilight of the same day, I saw a good number flit about in a very lively fashion on the banks of the Seine.—*H. M.*, *Birkdale.*

NOTES ON NEW BOOKS.

Elementary Text-Book of Zoology, by Dr. C. Claus. Translated and edited by Adam Sedgwick, M.A., and F. G. Heathcote, B.A. (London: W. S. Sonnenschein & Co.). To a seeker after scientific truth and knowledge that parochial mindedness which we sometimes dignify under the title of "Patriotism" gives place to a candid recognition of merit wherever it is found. Otherwise we should have regretted that no English Zoologist had provided students with a work of this class. Nicholson's Manuals go part of the way, but only a part. A really good text-book of Zoology, something like Sachs' Manual of Botany, was much wanted. Dr. Claus's name, both as a teacher and investigator, are well known, and this translation of his well-known manual will be thankfully received by zoological students. Let us add that we think the work has been improved by editing and translating. Certainly none could better have fulfilled this task than Mr. Adam Sedgwick. The chief feature which strikes us in reading the present work is its *lucidity*. The English is of the best, and the illustrations apt and pointed. Although it only includes the invertebrate animals from the Protozoa to the Insecta (in the special part), the preceding general part is of great value. Nothing in connection with the science and philosophy of zoology has been lost sight of, and the comparison of the same organs in different classes of animals, of similar structures, their embryological and general development, the discussion of the doctrines of evolution, natural selection, the historical review of Zoology—all of which are duly treated upon in the general part—recommend the work as a most attractive one. The woodcuts are very numerous and of a high artistic character.

On the Fossil Fishes of the Carboniferous Limestone Series of Great Britain, by J. W. Davis, F.G.S. (Dublin: Published by the Royal Dublin Society). Here is a work of quite another character, one which demands infinite pains and patience, and that quick and ready intuitive diagnosis of specimens which almost amounts to genius. And yet the author (a young man) is no salaried professor, or state endowed investigator, but a British manufacturer, with a brisk business to successfully superintend. British science owes much to such men, and we are proud of them—our Lubbocks, Evans, Tylors, Sorbys, and Davises! The present monograph will be a great boon to real workers, particularly on the interesting carboniferous limestone. Mr. Davis derived the materials for his examination and study from the well-known collection of the Earl of Enniskillen, now in the British Museum, South Kensington. He has laid under contributions the collections in the National Museum; the museums of the Geological Society, of Dublin, Cambridge, York, Bristol, &c., besides private collections. Mr. Davis accepts Günther's classification; and without devoting more than half a page to his introduction, he plunges at once into his subject, like a practical man. The plates are 65 in number, coloured, and very artistically got up; so that the volume is a credit to the Royal Dublin Society, and one which cannot fail to greatly enhance the high reputation as a palæontologist which the author has been deservedly earning for some years past.

Phillips's Manual of Geology, edited by Robert Etheridge, F.R.S., and H. G. Seely, F.R.S. (London: Charles Griffin & Co.). We cannot complain of want of manuals in geology, although palæontology is by no means so well off. The present volume is devoted to "Physical Geology," and is edited by Prof. Seely, who has taken the well-known and almost classic work of Prof. John Phillips as a basis, and it evolved this book. It must have been a harder task for Mr. Seely to work on these lines than to have written an original manual. But he has loyally fulfilled his work, and under the rôle of editor, has really given to geological students a work, whose erudition, painstaking succinctness, and thoroughness, none would have more heartily recognized than the genial John Phillips himself—who would have been amused in no small way at finding how his little book had grown into a big one! Many of the illustrations are those used in the original work.

The Student's Elements of Geology, by Sir Charles Lyell, Bart., F.R.S. Fourth edition, Revised by P. M. Duncan, F.R.S. (London: John Murray). It is late in the day to praise Lyell's Elements. It is far beyond the region of criticism. But one feels glad that so old a friend as this book is—endeared by those recollections of the past, when it sent us with delighted enthusiasm to the work, and the fossils of which it treated—has not been allowed to fall out of the ranks of geological literature. It is seven years since the last edition appeared, and geology has progressed marvellously in the meantime; more particularly with regard to the help it has received from microscopical investigation. The publisher was fortunate enough to get an editor who has a high reputation as a geologist and palæontologist, and who also knows how to write for students. Consequently this is by far the best edition of Lyell's "Student's Elements," which has ever appeared.

Plant-Lore, Legends, and Lyrics, by Richard Folkard, jun. (London: Sampson Low & Co.). No department of natural knowledge has taken such a hold on the public mind as plants. No other natural objects are so intimately associated with the historical mental and moral development of mankind at large, or have so grown up, and intermingled with its hopes and fears, joys and sorrows. There is hardly a common wayside weed which is not sanctified to us in these modern times by

associations of this kind! It is a right and a good thing not to allow these old-world beliefs concerning the ascribed virtues, &c., of plants to die out. Consequently we warmly welcome the handsome volume before us, in which the myths, traditions, superstitions, and folk-lore of the vegetable kingdom are fully worked out. The author is also the printer of the book—so that it is everything the book-lover can wish as regards type, woodcuts, paper, &c. Moreover, the fact lends additional point to the remarks already made concerning the contributions made by British industry to British science. Mr. Folkard has the charm of an interesting and clear style, as was unavoidable from the thorough manner in which he is interpenetrated with his subject. His book displays much learning and research, and it is both pleasant to read, and useful to refer to.

Origin of Cultivated Plants, by Alphonse de Candolle (London: Kegan Paul & Co.). This is another of the now famous "International Scientific Series," and it is also one of the most important, both on account of the high scientific rank of its author, and the importance and interest of the subject-matter. The latter is almost as much archæological and historical as it is botanical and horticultural; for many of the most important of our food-plants have their origin lost in the mists of antiquity, just as the races of mankind are. Prof. de Candolle only deals with the plants useful as food, he leaves out the medicinal kinds. With wondrous patience and learning, he has traced the history of some plants for thousands of years back, and shown how their culture was carried on at different epochs. At the same time he points out, that three out of four of the original homes of cultivated plants (as indicated by Linnæus) are wrong. Nevertheless, these have been continuously repeated by subsequent authors, who will now have a better authority to appeal to.

Leisure Time Studies, Chiefly Biological, by Andrew Wilson, Ph.D. (London: Chatto & Windus). This is the third edition of a series of essays and lectures, whose literary success is proved by the fact, that their republication is thus constantly called for. Dr. Wilson has a very quiet but effective way of telling what he has to say, which charms his readers into following him from essay to essay. Some of these (as that on corals, for instance) are models of how much information can be clearly and effectively packed into so small a space. The last essay on science and poetry rises to a lofty expression of poetical feeling, and its perusal would be a complete answer to those who imagine that science and poetry are antagonistic to each other.

Effie and Her Strange Acquaintances, by the Rev. John Crofts, M.A. (Chester: Phillipson & Golder). After reading this delightful child's book ourselves, we subjected it to the criticism of a little book-worm of ten years old, who has read it four times through! This will be considered as a fair test of its readable character. The author has skilfully combined the form of Kingsley's "Water-Babies" with Carroll's "Alice in Wonderland," and has brought out a book which plainly shows how much he loves both children and flowers, or he could not intellectually cater for them so attractively.

The Geology of Weymouth, by Robert Damon (London: Edward Stanford). This is a new and enlarged edition of a very successful geological handbook to a very attractive and highly fossiliferous locality—a locality known to the author for many years. The volume is beautifully got up, and well illustrated; and no naturalist, certainly no geologist, ought to be without it who wishes to enjoy the feast of fat things offered in our Southern English coasts.

Natural History Sketches among the Carnivora, by Arthur Nicols, F.G.S. (London: L. Upcott Gill). The delightful freedom from any form of literary stiffness which marks all this author's previous works is evident in the present. It is a most attractive volume, inside and out; and the subject, although to some extent a hackneyed one, is redeemed by the graceful style of the author.

The Speaking Parrots, by Dr. Karl Russ (London: L. Upcott Gill). This is a nicely got up manual, dealing with the habits, food, training, health, &c. of this class of birds. We are frequently asked to recommend a book of this kind, and we are therefore glad to draw attention to it, and to speak of it as one which seems to fulfil all the requirements of "A Manual of Talking Birds."

The Universe of Suns, by R. A. Proctor (London: Chatto & Windus). It requires only the announcement of a new book by Mr. Proctor, for it to be read. The present volume consists of a series of essays, chiefly relating to solar and planetary astronomy, and embracing earthquakes and volcanic phenomena, and even social subjects, all discussed in that terse and elegant English of which the author is so skilled a master. It is a most delightful book to read.

The Story of a Great Delusion, by William White (London: E. W. Allen). A nicely printed, and altogether attractively got up book. The literary contents are about as hopeless a jumble as we ever saw in print, and a believer in vaccination could not desire to inflict a more refined act of cruelty upon an anti-vaccinator than oblige him to read the present volume right through.

Rabbits, by R. O. Edwards (London: W. Swan Sonnenschein & Co.). A handy little manual on this perennial subject, as useful to the amateur as to the professional rabbit-keeper, with full and minute details relating to everything which concerns the well-being of these familiar pets.

List of British Vertebrate Animals, by Francis P. Pascoe (London: Taylor & Francis). All British naturalists should procure this most useful and compact little manual. It will save much time, and

assist in securing greater accuracy. The newest views and changes in classification are included; and, although the book is a small one, there is a good deal in it.

Nature's Hygiene, by C. T. Kingzett, F.C.S. (London: Baillière, Tindall, & Co.). Although this is the second edition of a book which we noticed favourably when it first came out, the author has improved it by partly rewriting some chapters, and adding others, as water supply, sewage, infectious diseases, &c. It is a good practical manual on all matters relating to health, and we are pleased to see the public taking so much greater interest in this subject as to require a second edition.

The Naturalist's World, edited by Percy Lund (London: W. Swan Sonnenschein). This is the first volume of a bright and attractive monthly magazine, published under the auspices of the Practical Naturalists' Society. It covers a good deal of ground, contains a variety of well-written articles, and shows plain proof of careful editorship.

We have also received a neatly got up volume, containing the *Reports* of the Meetings of the Scientific Association recently held in Montreal and Philadelphia, as given in the American weekly journal *Science*. It is a very handy volume, and contains the pith of the best papers and addresses, carefully edited.

GAULT FOSSILS AT FOLKESTONE.

DURING a recent visit to the Warren, near Folkestone, Kent, in search of Lepidoptera, the weather having become unfavourable, I was obliged to turn my attention to some other branch of Natural History, otherwise I should have to return with empty boxes. On looking from the cliffs above the Warren, I observed the dark line of gault near the beach, and remembering having read that fossils were to be obtained somewhere near this spot, I thought I would become a geologist, for the first time.

On descending the cliffs, "which are here much broken, and often very wet from the springs which trickle over the impervious clay to the beach," I soon observed remains of shells in various parts of the gault, but, on attempting to dig them out, I found that it was almost impossible to obtain them in perfect condition; however, I managed to get a few specimens of such species as *Inoceramus concentricus* and *I. sulcatus*, *Ammonites interruptus* and *A. auritus*. These Ammonites were mostly broken in extricating them from the clay in which they were found.

I then turned my attention to the beach, and found the fossils were much more plentiful there, but they were in most cases in the form of interior casts filled in fact with iron-pyrites, but many were very perfect. By searching under lumps of clay and boulders, I found many species, such as *Ammonites varicosus*, *A. lautus*, very plentiful; *Nucula ovata* and *N. pectinata*, common, but only occasionally found perfect. *Nucula vibrayana*, not so common as the two other species. *Belemnites minimus*, *B. ultimus* and *B. attenuatus*, rather plentiful. These singular objects when water worn, are not unlike bits of slate-pencil, a comparison which I fear will shock a geologist.

In some places lately left bare by the tide, I found hollows in the gault filled by a deposit consisting of small fossils, pebbles and fragments of iron-pyrites. I here found many small species, some of which I have not yet got named, *Aporrhais Parkinsonii* and *A. rostellaria*, rather plentiful, but very imperfect. *Hamites tuberculatus*, only broken parts of this species could be found, also portions of serpula tubes, and encrinite stems. *Corbula gaultina*, two specimens only were found on this occasion, but, being much pleased with my first attempt at collecting fossils, I went again, and obtained many specimens of *Corbula gaultina* and also *Cardita tenuicosta*, *Solarium ornatum*, some nearly perfect. *Acteon*

Fig. 26.—*Inoceramus concentricus.*

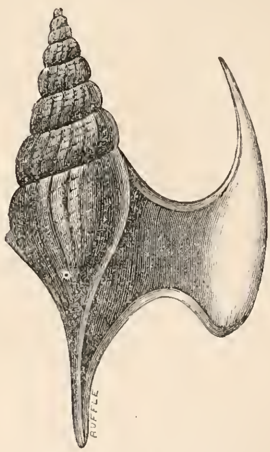


Fig. 27.—*Aporrhais Parkinsonii.*

pulchella, *Hemiaster minimus*, *Trochocyathus harveyana*, a few specimens of each were found. Many specimens of a cerithium [?] were found, but not perfect. *Natica gaultina*, a few were obtained in a fair state of preservation. *Hamites rotundus*, only broken bits of this species could be obtained. *Rostellaria carinata*, a few good specimens were found. I also found a few specimens of *Bellarophina miniata*: a species which I understand is rather rare; it is certainly rather difficult to find, on account of its small size and general resemblance to a rounded fragment of ironstone. A shark's tooth was obtained fairly perfect,

Fig. 28.—*Ammonites lautus.*

and also a number of small teeth, not yet named. These are remarkably perfect. All the above smaller species require much care to detect and separate them from the sand and stones. I observed that the few persons who did collect the fossils appeared to look for the larger Ammonites only, taking very little notice of the smaller species. I think the fact that I have obtained nearly thirty species in two or three visits to this locality, may be of interest to many. My object in writing the above list, is to induce others to collect. I am indebted to Mr. Newton, of the Geological Museum, London, for his kind assistance in naming my specimens.

A. H. SHEPHERD.

London.

GOSSIP ON CURRENT TOPICS.

By W. MATTIEU WILLIAMS, F.R.A.S., F.C.S.

THE very active people who have lately been denouncing physiological investigations made upon living animals, and misrepresenting 97 per cent. of them by applying the title of "vivisection"; and who evidently imagine that all perpetrators of physiological research are mere sportsmen finding personal enjoyment in the infliction of pain and death upon helpless animals, should read Dr. Richardson's lecture on "The Painless Extinction of Life in the Lower Animals," delivered at the Society of Arts, and published in the Journal of that Society for December 26th last. They will learn thereby that a very eminent physician and experimentalist, who according to their confession of faith should be a heartless beast-torturing ogre, has during more than thirty years been working most industriously, at considerable expense of money and still greater cost of valuable time, without any pay or prospect of pay, in devising methods for rendering the customary slaughtering of animals absolutely painless. If these denouncers of vivisection are really sincere they will at once emulate the truly humane efforts of Dr. Richardson, will sacrifice their time, their labour, and their cash as he has done, by co-operating in a great national effort to introduce the use of the "lethal chamber" in all our slaughter houses. There is no excuse for holding back, as the effectiveness of the method has been practically demonstrated and is practically carried out at the "Dogs' Home" at Battersea, where as many as a hundred at a time of dogs, that would otherwise be violently butchered, are gently made to sleep, *not suffocated*, but lulled by a device as painless as the cradle rocking of an infant. In this simple sleep they remain until the heart follows the example of the dormant brain, and beats no more. All the practical details are described and illustrated in the above named report; and a society is already formed for carrying them out on animals to be killed for food (The London Model Abattoir Society of which Dr. Richardson is president); the heaviest of the work is already done. I have a list of the names of many that have spoken loudly as antivivisectionists, and shall look for those same names among the leading supporters of this movement. If they do not thus appear, I shall be driven to conclusions that need not here be specified and which will be shared by all who appreciate moral consistency.

The Students of the University of Paris are forming an association which is to be worthily inaugurated by a public celebration in honour of the oldest living philosopher, M. Chevreul, whose hundredth birthday will presently be attained. In a paper which he read at the Academy of Sciences two years ago, he had occasion to say:—"Moreover, gentlemen, the observation is not a new one to me. I had the honour to mention it here, at a meeting of the Academy on May 10th, 1812." Here is a chemist about as old as chemistry (which can scarcely be said to have existed before the discovery of oxygen), and still alive, and intellectually vigorous. Fontenelle, who died in 1750, was nearly as old, and shortly before his death said to his inquiring friends, "I have no suffering, but am feeling merely an increased difficulty of living." In another part of the same number of "Nature," from which I quote this saying of Fontenelle, are the last words of John Lawrence Smith, the American chemist, geologist, and engineer; they were "Life has been very sweet to me; it comforts me. How I pity those to whom memory brings no pleasure." Such expressions, such feelings in the evening of life are the logical

results of earnest devotion to Science. The gloomy visions of a wicked, ill-fashioned world, and dread of a worse to come, which darken the later moments of so many of those who have groped through life in the midst of artificial darkness due to the blindness of ignorance, is impossible to men who have earnestly explored the wondrous harmonies of Nature, and have done so not merely for trading purposes, but with genuine scientific enthusiasm. Neither the past nor the future can appear ill-shapen and miserable to them.

The influence of coloured light on plants, concerning which such contradictory conclusions have been formed, has been further studied by Hellriegel. In his later researches he arranged the plants so that they should have the benefit of free air during fine weather, and be removed to shelter in bad weather, instead of keeping them continuously in a glass house. Better general results were thus obtained. Barley plants were grown under blue cobalt glass and yellow carbon glass. Less ash and more organic matter were produced under the blue than under the yellow. Those under the blue glass grew well, while those under the yellow seemed to be retarded, and when shaded were long in the internodes, and the leaves were thin and delicate. The general conclusions derived from these and other experiments are, that leaves are not very sensitive to *moderate* changes in the composition of the light to which they are exposed, and consequently that the modifications of light produced by the ordinary glass of greenhouses can have but little effect, so little that there is no practical necessity for specially selecting the glass used for this purpose.

The persistence of an old fallacy has been curiously shown by a paragraph which has lately "gone the round" of the daily papers. After describing the bursting of water mains in Buchanan Street and Paisley Road, Glasgow, and the stoppage of the music in the churches having hydraulic organs, we are told that "sudden thaw after the severe frost caused the bursts."

Another popular fallacy, not quite so elementary, is continually breaking out among newspaper correspondents. The following, written from Vevey, appeared in "Nature," December 11th. "On the night of November 28th, at about six in the evening, I went to the window to look at the moon, and saw, as it were, a second moon, behind the other. The effect was so like what one sometimes experiences from suddenly going out of a light room, *or other causes* (my own italics) that, at the time, I fancied it was only a defect in my sight. On going into my son's room an hour afterwards, he said, 'If something has not gone wrong with my eyes there are two moons to-night.' On this I went out again, but only saw one moon as usual. Later in the evening, a young girl who had been meeting a friend at the Montreux train, said her friend had said the moon looked *queer* all the while she was in the train. The night previous a pretty severe shock of earthquake occurred in Geneva and Lausanne, and a few hours after we had observed the moon on the 28th a very violent gale and snowstorm took place." It should be noted that this account states that each of the observers saw the double moon through windows, and that the writer only saw one moon "on going out." Herein lies the explanation without invoking any of the "other causes" to which temporary double vision is usually attributed. The moon, or any other luminous object viewed obliquely through a pane of glass, is always visually doubled. The light passing obliquely through the side of the glass next to the luminous object is reflected when it reaches the inner surface next to the observer, and then is re-reflected by the opposite inner surface, and thrown towards him. This second reflected image appears near to the directly transmitted image, but is not coincident with it, the distance between varying with the thickness of the glass. When the object is large, it only appears to have blurred outlines, when small the true double character of the image is evident. Double stars may thus be discovered without any telescopic aid.

After all the protection and subsidies and bounties that have been bestowed on that very political agricultural product, beet sugar, it is now in danger of being outrivalled by Sorghum sugar. German and French chemists are working out the scientific elements of the problem. In Biedermann's Centralblatt, V. Pfuel describes his experiments on its cultivation, finds that when the seed ripens there is 15 per cent. of sacchrose present; before that time, only from one to three per cent. After the autumn cutting the plants throw up a good fodder for sheep. N. Minangoin, in the same journal, says that Sorghum may be cultivated in France at less cost than beet, that its yield of molasses is less, but good brandy is obtainable from it, and the residue makes good fodder. Beet and Sorghum are evidently running a close race, with the advantage of the start and consequent experience and skill, on the side of the beet. But this may not be maintained.

Two elaborate, and from a purely chemical point of view, able papers are contributed to Dingler's Polytechnisches Journal by E. Valenta, on the action of glacial acetic acid on different oils. One of the results of these researches, which the author claims, is the detection of the adulteration of mineral oils with resin oils, the resin oils being soluble in acetic acid, the mineral oils almost insoluble. The idea of such adulteration is rather amusing now that these mineral lubricating oils are so much cheaper than the imaginary adulterant. I find by the price current in last month's "Oil Trade Review," that the heavy mineral lubricating oils go as low as £5 per ton, *i.e.* about fivepence per gallon; the light mineral oils range from 6¼*d.* to 11¼*d.* per gallon, while light resin oil is 24*s.* 6*d.* per cwt. or 2*s.* per gallon. This is

something like the supposed adulteration of tea with iron filings, which was so gravely and repeatedly asserted to be a widespread commercial villany, until (in 1873) I showed that in China iron filings would cost more than tea leaves, and that the adulteration, if practised on this side, to the asserted extent would demand four or five million pounds of selected fine iron filings per annum, sufficient demand to produce an extensive and very visible traffic to London, which is the tea port of Britain. The fact is, that iron filings are practically unsaleable from absence of demand. Firework makers use a few steel filings.

OBJECTS OF INTEREST IN OUR PIT DISTRICT.

A STRANGER travelling through our district would meet with no rugged scenery, or headlong waterfall. For a radius of a few miles, he would find he was entirely free from any mountain, and a level piece of country would stretch before him. Looking eastward, he would have a clear sea view of the sea only a few miles distant. Turning in any other direction, he would see numerous small plantations mixed with farm houses, and a few villages teeming with a busy population. If he were fond of botany, he would find some very interesting plants. If an ornithologist, he would see some fine rookeries, as well as flocks of starlings. The latter used to be a migratory bird, but has now, for several years, remained all the winter through. Often have I stood in the summer evenings watching their movements. Magpies he would not see, as they have for more than twenty years entirely deserted our district. The conduct of our youngsters, I fancy, will have been the cause of their desertion. The ornithologist would only on very rare occasions meet with any blackcaps, as they are with us fast dying out. Two species of wagtail stay with us long after the migratory birds have left us. A lover of entomology would meet with the two garden white, red, admiral, small tortoiseshell, orange tip, meadow brown, painted lady, the small copper, and occasionally the peacock. The small streams are well stocked with small fishes. I give an extract I once sent to a Newcastle paper on our stickleback. One fine summer evening, the sky very clear, the air quiet, the scenery calm and peaceful, and all nature appearing at rest, I took a stroll by the side of a gentle stream. In my company was a gentleman who was very anxious to be shown some nests of stickleback, as he had never before seen anything of the kind. As we wandered along, shoals of stickleback darted rapidly past us, for, with their keen sense of sight, they soon recognised us on the banks as strangers. We sat down on the bank, and the fish soon returned, and began their usual pranks. The males took their places and stood guard over their charmed circles, like the Roman soldiers of old went on doing their duty, and ready to die rather than be driven from their posts. My friend expressed much surprise to find all those having the prettiest colour to be the worst tempered. "Yes," I said, "that is true, but let us look at their motive. You see those little raised mounds, with a round hole in the centre; they are nests, and the coloured stickleback you see close by are the males guarding their precious homes. The males have the places to select, the nests to build and to keep in order, the females coming when all is right, to deposit their spawn, and, unless the nests were closely guarded by the males, not only against the attack of other fishes, but even against the parents themselves, as the ova or spawn is always a precious meal to fishes, they would soon be destroyed." Their colour I have found to be mostly due to their valour in fighting, the bolder they are the more fierce they look, and the more courage they show in defending their nests the more colour they get. I have frequently seen females go from nest to nest, depositing ova without being molested. Yet, at the same time, I have seen them chased away, when I much fancied they had not any ova to deposit. The nests I could see were repeatedly visited by the males. 1st. To see the nests are kept in order, and to make fast any loose material by a gummy substance which they have the power of discharging. 2nd. The eggs of the female have to be fertilised by the males; without this the fecundity of the eggs would not take place. Now these eggs, and those of snails, frogs, &c., that I have examined, are the same shape as the eggs of birds, when viewed under the microscope. As I was in want of a nest for my home aquarium, my friend insisted on taking one home. He stretched himself across the stream with his head close to the nest which he wanted, and which was only a few inches under the water. As he listened very attentively, he fancied he heard something moving. Presently the whole brood of young ones came away, and so fascinated were we with the sight before us, that a few seconds passed away before we could speak to each other again. He took off his round felt hat, and indented the crown so as to hold about a pint of water. Into this miniature vessel he placed the whole shoal of young. This mass of life, so newly ushered into existence, was to us the most interesting of all sights we had before witnessed. I have found these last few years, that that pretty little fish the minnow fails to keep its own in the struggle for existence, in some of our very small streams. Where it used to be plentiful, it has now entirely died out. They fail to stand the repeated attacks of the pugnacious sticklebacks. The traveller in our country would pass acres of land, scarcely fit to graze a single animal. On his route he would notice a peculiar looking hill, or heap, varying in different shades of colour, mingled with patches of the

coarsest of grass, to which no living animal would care to give a passing glance. All the strata are cut through; when sinking a pit the rubbish is sent away. When the pit gets under way, falls of shale are almost of daily occurrence, and the greater part of this shale has to be brought away, which soon makes the heaps grow larger. The geologist will perhaps find in no part of the world so rich in fossil

Fig. 29.—*Anthracosia ovata*, a common fossil in coal shales.

remains, as those refuse shale heaps, met with at our colliery places. If he were to split some of the shale open, he might find abundance of fossil mussels, such as Anthracosia, as well as of fossil ferns and other plant remains, and thus discover that even in our district there is plenty of interest, although it is only a Pit one!

JOHN SIM.

Northumberland.

ON THE EMBRYOLOGY OF *BOTYS HYALINALIS.*

By DR. J. A. OSBORNE.

WHILST according the first place in embryological research to the method of investigation by means of sections, Dr. August Weismann, in his latest work ("Beitr. z. Kenntniss d. ersten Entwickelungsvorgänge im Insektenei," Bonn, 1882), is yet of opinion that the older method, by "continuous observation of the living and developing egg," has of late years been much underrated. "There are," he says (loc. cit. p. 2), "certainly phenomena of development, where the method by section fails us altogether, and of whose course, nay, very existence, only direct observation gives us any intelligence." Perhaps there are few eggs of insects which, owing to their extreme flatness and transparency, are better suited for direct observation during development than those of *Botys hyalinalis.* They are small oval discs of about 2·3–2·5 mm. in length by 2 mm. or rather more in breadth, not thicker in proportion than the body of a sole or plaice is to its diameter, and thinning off in like manner to a sharp edge at the circumference. The shell is transparent as glass, and the view but little impeded by the somewhat coarse reticulations of the chorion in irregularly polygonal fields with linear borders and uneven areas.

On the 4th of August last, I received by post from Mr. W. R. Jeffrey, of Ashford, Kent, a small batch of seven of these eggs which had been laid on glass some time on the morning of the 2nd. The batch had a somewhat greasy whitish appearance, and on closer inspection the eggs were seen to be arranged in an oval or ring of six surrounding a central one, but all overlapping, in such a manner that the central egg was overlain by three at one end of the oval, and overlay the three at the other end; whilst of the former three the middle (or remotest) egg overlapped the other two, and of the latter three the middle (or nearest) egg was overlapped by them. The lateral pair of the first three also overlapped the lateral pair of the second three, but the eggs of each pair did not touch each other. In this arrangement there was one egg (only) at the nearest extremity of the long axis of the group, which lay directly on the glass without overlying a part of any other; and one (only) at the other extremity of the axis, which, overlying two others in part, was itself not overlapped by any other. The conclusion appears inevitable that these eggs were respectively the first and last laid in the group: otherwise a later egg must have been partially inserted beneath one already deposited on the glass—a supposition which the character of the eggs themselves would appear to negative decidedly. I found it convenient, taking the longer axis of the group as a meridian running north and south, and designating the central egg as "C," to distinguish the others by the points of the compass, as N., S., N.W., &c., and regarding the group always from the free side. The moth, then, in depositing her eggs, must have proceeded along the glass in a general direction from south to north; and the eggs must have been laid in the following order:—S., S.W. and S.E., C., N.W., and N.E., N. The order of precedence in the lateral pairs is not determinable from these premises. Subsequently Mr. Jeffrey sent me the shells of another group of nine of these eggs, laid at the same time, which give some further insight into the method of oviposition. In this group, which has a transversely elongated rhomboidal form, the extreme lateral eggs, E. and W., which were absent in the first, are present. Here it is plain that the eggs were laid in rows of three each, forming an acute angle with the meridian, and each row beginning a step further east or west and further north than the row before it. The order must (most likely) have been S., S.W., W.; S.E., C., N.W.; E., N.E., N.; or else, S., S.E., E.; S.W., C., N.E.; W., N.W., N. I enclose diagrams (Figs. 30 and 31), the better to illustrate my meaning, but if it should be inconvenient to engrave these, the grouping may be very well imitated with the requisite number of pence or half-pence, taking the vertical line of the figure on the coin to represent the long axis of the egg. In all cases the long axis of the egg-oval lay north and south, i.e. parallel with the meridian of the group; and, as subsequent observation showed, *in*

all cases the head of the embryo lay south. The question now arises : does the south end of the egg correspond with its lower pole or first laid end? This question must be answered affirmatively, unless we are prepared to admit either, on the one hand that the eggs in laying could have been partly slid under ones already laid, which their thinness and delicacy and their firm adhesion to the glass and to one another seems to render impossible; or, on the other hand, that the ovipositor of the moth, whilst lower pole, we arrive at the conclusion (somewhat important, inasmuch as it is at variance with the statement of Leuckart that "the upper pole in *all* cases contains the head end of the embryo."—See Entom. Month. Mag. vol. xx. p. 146), that in these eggs the head of the embryo normally occupies the *lower pole* of the egg. The physiological reason is obvious. In those cases where (as in *Pieris brassicæ*) the egg is attached by its lower pole to the food-plant, the escaping larva, if its head occupied that end,

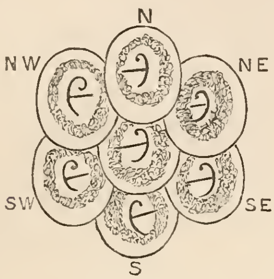


Fig. 30.

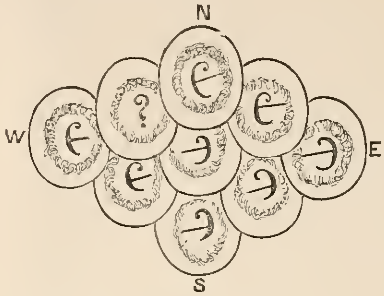


Fig. 31.

Fig. 32.

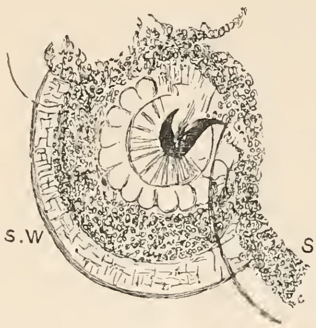


Fig. 33.

Fig. 34.

Fig. 35.

Fig. 36.

Fig. 37.

Fig. 38.

Fig, 39.

depositing the egg is bent in under her venter so as to extrude the egg with its lower pole to the front. Such an inversion of the normal orientation does take place in the case of the sawfly (*Zaræa fasciata*), and probably also, more or less, in the case of other insects laying their eggs in mines or in the ground, or in other situations where a long ovipositor is required, but I am ignorant that there are any grounds for such an assumption in the case of *Botys*. Taking it for granted then that the south end of the egg is its would not only have to eat its way out of the shell, but also through the substance to which the egg was attached ; while in the case of *Botys* if the head of the larva occupied the upper pole, it would, after eating its way through its own shell, come in contact with the egg above it with disadvantage to itself and probable destruction to its neighbour.

When I received the eggs on the 4th of August, they were already in the third day of incubation, and presented the following appearances. The yolk-

granules were aggregated in spherular masses, which again were arranged in two groups: an annular larger mass having a clear space outside between it and the shell, and a clear central area in which the smaller mass lay in an irregularly curved spiral or crescentic form. For the sake of convenience, I shall call these two masses of opaque yolk the Annulus and the Spiral. The former was composed of yolk-spherules (i.e. aggregated masses of yolk-granules), arranged, somewhat loosely at first, but by degrees more compactly, so as to flatten their sides and give them a polygonal form, in a flat oval ring, having the same contour as the egg itself, but gradually wider at one end than the other, not unlike a horse-collar. The broader end was at first in all cases (except, perhaps, N.W.) towards the south end of the egg.* It maintained its shape with little change, except some diminution in width and increase in density, all the time that the eggs were under observation, i.e. till the 9th August, when they were unfortunately destroyed by an accident a day or two before hatching would have taken place. The spiral, on the contrary, was constantly undergoing change, and it soon became evident that its convex border was the true seat of development. Regarded as a mass of unchanged yolk, it had, on the 5th August, somewhat the appearance of a double scroll (Fig. 32), something like the capital of an Ionic pillar, and with a stalk between roughly corresponding to the shaft of the pillar, or, at least, the upper end of it. The volutes of this scroll or double spiral were not similar. One was sharp, dark and well defined; the other vague and changing, and made up of looser granules of yolk. In all cases the sharper well-defined volute lay towards the north. The stalk or shaft between the volutes pointed in a general direction east or west, and after some hours became more slender and formed an attachment with the annulus on the inside. At this time the scroll was not unlike the vertebrate embryo in an early stage with its umbilical stalk, and, as no doubt yolk granules passed into the embryo by this channel, there may have been something functional in the resemblance as well.

To explain this annular arrangement of the food-yolk it is necessary to refer to the formation of the amnion. After the yolk has become surrounded by the growth of cells called the blastoderm, and after the germinal stripe, or foundation of the embryo, has been differentiated along one side of this blastoderm, a double fold of the latter grows up all round the circumference of the germinal stripe and finally closes in over it, the edges of the fold fusing together and the two layers (of blastoderm) of which it is composed at the same time separating from one another. The inner of these, continuous with the embryo itself, and lying immediately over it, is the amnion; the outer, continuous with the blastoderm surrounding the yolk, is the serous membrane. Two sacs are thus formed, the one within the other, and between them lies the yolk. In the lepidopterous egg the yolk next finds its way into the space between the amnion and the serous membrane, flowing over the former, and depressing it and the embryo beneath it till both are completely submerged in yolk and consequently hidden from view. But owing to the extreme flatness of the *Botys*' eggs, little or no yolk finds its way to the sides of the embryo, but is constrained to lie in a ring around it, leaving the centre clear, except that part immediately beneath the germinal stripe, which by the involution of the two extremities of the embryo becomes soon reduced to a narrow capitate peduncle, the "umbilical stalk," &c. (Fig. 33).

A glance at the diagrams (Figs. 30 and 31), will show that the umbilicus did not lie uniformly in one direction east or west. When it had its attachment to the annulus on the west, this meant that the venter of the embryo was facing east, and that (having its head south) it was lying on its right side or with its right side next the glass: and *vice versâ*. This arrangement may be very well imitated with the half-pence by placing them upside-down, and with the queen's head up to represent the embryo on its right side, and the figure of Britannia up to represent it lying on its left side with the venter looking west. The only thing to be noted in this connection (and the small number of the total observations makes it the less reliable), is that in both* groups of eggs all the lateral eggs, i.e. those not situated on the central axis or meridian of the group, had their umbilici directed towards the meridian, and their ventres consequently looking outwards. To this statement there were two exceptions in the group of nine; viz. N.W., which did not develop at all, and N.E., which had its venter looking inwards, but failed to hatch out.

There was a considerable difference in the rate of development of the different eggs in the group of seven. S.W. appeared to be the most advanced, although latterly N.E. was not much if anything behind it. But N.W. was all along several hours behind the others in its development. These might be arranged in the order of development thus:—S., S.E., N., C.; but with smaller differences between them. On the evening of the 6th August the umbilical stalk and spiral had dwindled to a small dense inverted cone with a rounded base and having its apex at the annulus (v. Fig. 33). On its north side a sort of notch separated the sharp curved bird-like beak from the rest of the stalk. The clear central area was

* Under date August 7th, I have the following note. "In the three northern eggs it is the northern half which is widest now—in the three southern, the southern half, and more distinctly so."

* In the group of nine eggs I deduce this from Mr. Jeffrey's observations communicated by letter.

therefore much increased in size, but not so limpidly transparent as the (empty?) space surrounding the annulus externally. Immediately within the annulus, on the morning of the 7th, I observed the clear area all round to the peduncle or umbilicus on both sides, to have its outer edge crenated. In the more advanced eggs these crenations soon developed into a row of (ventral) segments, twelve in number, marked off from the rest of the central area by a curved concentric line. These segments had an optical area from four to six times as large as the reticulations of the chorion (say about $\frac{1}{200}$ inch in diameter). Soon three of them, at the south extremity of the series, appeared larger than the rest and furnished with processes sloping northward; whilst still further to the south, but less distinctly, two or three other segments could be made out having also processes sloping in the opposite direction. Into this space, corresponding to the region between the head and the body, faint cloudlets of yolk-granules appeared as it were passing in from the annulus towards the central area. Owing probably to the sloping in opposite directions of the thoracic and cephalic processes, there was less pressure here of the amnion against the serous membrane and freer passage for the yolk. This appearance at this region was visible persistently in all the eggs (Fig. 34). The thoracic processes or legs were about half the width of the segments from the posterior half of which they took their origin, but considerably longer, passing out of sight in the annulus (Fig. 34). About this time I noticed also other appearances as of curved concentric lines marking out a tube (mesenteron?) but which would require further observation for their certain interpretation. Upon the same day (Aug. 7) in the afternoon, I noticed eye spots (in all but N.W.) a group of about six arranged in a circular form (Fig. 35). There were now visible at least four cephalic segments, and it was at the base of the third (reckoning from behind forwards) that the group of eye-spots was situated. Later on I saw a fifth larger terminal mass forming the extreme anterior extremity of the embryo. The thoracic legs appeared to be jointed. At 2.50 P.M. I noticed that the twelfth (ninth abdominal) segment was somewhat longer than the others and projected inwards towards the centre, beyond their level. At 6.55 P.M. this inward projection had disappeared, and a very important change in the terminal segment had been initiated. It had become ventrally incurved upon itself (Fig. 36). This segment was elongated, and narrowed at the apex. It advanced steadily forwards along the ventral aspect of the embryo, followed by the others, and growing larger at the same time; but the head remained always in its original place. On the morning of the 8th the last three segments (10-12) were round the corner (Fig. 37); at 9.10 A.M. the tail was in contact with the metathoracic legs; at 12.45 P.M. it had gone beyond the two posterior pairs of legs, which, with the forelegs, were now directed forwards in place of backwards as at first. The middle of the bend of the abdomen (at the incurvature) was between the third and fourth abdominal segments; at 1 P.M. the tail had come quite up with the fore-feet; at 2.40 P.M. it reached fully up to the head and fully filled the larger northern bay. At this time the stump of the umbilicus on the one hand, now reduced to a mere conical point, and a similar projection from the opposite side of the annulus, where cloudlets of yolk-granules were passing in towards the neck region (see Fig. 34), indicated a division of the whole interior space into two unequal bays, of which the smaller (southern) contained the head, and the other the rest of the body. The second abdominal segment might be said to form the keystone of the arch where the abdomen was bent on itself, but the head, though free in its bay, remained mostly in close contact with the umbilical stalk. On the morning of the 9th the tail reached quite to the level of the head and beyond the eye-spots. The embryo lay in a loop with the legs inside, a position which it had reached by the growth and enlargement of the tail without any change of place in the head and anterior segments.

I have dwelt at some length on this incurvature and growth of the tail by which the lepidopterous embryo attains the loop-form in the shell, because Kowalevski has stated (Mém. de l'Acad. Imp. des Sciences de St. Pétersbourg, vii. série, tome xvi. No. 12, p. 56), that it does so by the whole embryo turning round in the shell after its tail. "Dem Hinterende folgend, dreht sich der ganze Embryo so, dass er jetzt der ihn noch bedeckenden serösen Hülle den Rücken zuwendet, und die Extremitäten erscheinen nach innen gerichtet." Perhaps the subject may be made clearer by a brief consideration of the different kinds of motion which may be observed in eggs. These may be classed under four heads. 1st. Movements due to gravitation. The ventral or developing side of the yolk in the egg of *Gastrophysa raphani*, e.g., turns always towards the upper surface, though this change takes place so slowly that it may occupy several days in completion. 2nd. Movements of growth; strikingly illustrated in the egg of *Calopteryx*, in which the embryo becomes inverted in the shell (v. Balfour, Comp. Embryol. i. 334). 3rd. Embryonic movements; by which limbs or parts show movements without any change of place in the whole; and, lastly, larval movements; when the perfectly formed embryo changes its position in the shell, or acts in any other way as if it were independent of it. The loop form of the lepidopterous embryo, Kowalevski supposes to be due to the latter class of movements, whilst in reality it is only a movement of growth. When, in its final stages, as stated by Kowalevski and as observed in these eggs by Mr. Jeffrey, the embryo of *Botys* devours the remainder of the yolk and cuts its way out of the shell, these actions may be fairly described as larval movements.

On the afternoon of the 8th August, I had a pretty clear view of the head unobscured by the annulus. The four processes were approximated like the fingers of the hand, whilst the fifth or terminal lobe lay away from them like a thumb (Fig. 38). Projecting into the bay between the thumb and the fingers, and crossing the latter obliquely, there was faintly visible another process which I was unable to follow further. On the other side of the umbilical stalk, now worn down to a conical stump, a dense crescentic streak of yoke had been as it were detached and carried away by the growth of the tail till it came to occupy the northern curve of the bay. This included yolk, according to Kowalevski, marks the extent of the mesenteron, in this case about a fourth of the whole alimentary canal. The incurved portion of the tail was free from the annulus, and its growth seemed to be caused by the formation of the dorsal half of the body carrying along the ventral segments with it. In the tail this dorsal portion increased much in size beyond the ventral, both in length and thickness. Up till its full growth the dorsal section of the abdomen had been without segmentation, but, in the afternoon of the 8th August, I observed it to be crenate externally; and that the indentations corresponded to the lines of division of the ventral segments. That portion of the dorsum extending beyond the venter and beyond the last crenation opposite the last ventral segment, was much larger than any other division, and showed itself a crenate division into three, of which the last, much narrower than the others, I supposed might turn out to be the anal proleg, whilst the penult crenation would represent the anal flap. I thought also I could trace the posterior section of the alimentary canal terminating in the space between the anal flap (?) and the proleg (?) In the evening of the same day I was able to distinguish four prolegs on the anterior abdominal segments, near the point of flexure, but could not see whether one or two segments intervened between them and the thoracic legs. On the 8th also, in the evening, the remote group of eye-spots became dimly visible through the transparent head. At first, directly opposite one another, the two groups of eye-spots diverged more and more till they came to be situated at the lateral borders of the head, and between, and rather in advance of them, a cupid's-bow-shaped line (Fig. 39) appeared to indicate the anterior border of the clypeus. The direction of this torsion of the head was always such that, whether the embryo was lying on the right or left side, its effect was to bring the dorsal aspect of the head next the free unattached side of the egg, and the under surface next the glass.

Unfortunately my observations were brought to an untimely close by an accident on the morning of the 9th, so that the last stages, as well as the earlier, both of which should have much of interest to offer, escaped me. I believe, however, that what I have been fortunate enough, thanks to Mr. Jeffrey's kindness, to see, is not without some interest and importance from its bearing on two points: the orientation of the embryo in the shell, and the incurvature of the tail. If there were any certainty of obtaining similar eggs another season, I would have reserved some of the other points for further observation: as it is, I cannot refrain from mentioning the hypothesis that, as plants are bent to or from the light by a preponderance of growth on the opposite side, so, here, the proximate cause of the ventral curvature of the tail end is the later, but then quicker and predominant growth of the dorsal section of the embryo.

Milford, Letterkenny.

SOME NEW DIATOMACEOUS FORMS FROM THE "SAUGSCHIEFER" OF DUBRAVICA.

By F. Kitton, Hon. F.R.M.S.

HERR GRUNOW in his "Beiträge zur Kentniss der fossilen Diatomaceen Oesterreich-Ungarn" ("Beiträge zur paläontol. Oester-Ungarns und d. Orients von Majsisovics u. Naumayr," Bd. ii. 1882), describes the following diatomaceous deposits found in Hungary: (1) "Saugschiefer" (absorbent slate) from Dubrávica; (2) Polierschiefer Tallya; (3) the argillaceous tufa from Holaikluk; (4) diatom deposit from Kis-ker; (5) Kieselguhre from Eger and Franzenbad in Bohemia. The last named deposits are generally well known to Diatomists (particularly that found in Franzenbad). Ehrenberg described many of the forms in the "Monatsberichte" of the Royal Academy of Berlin, 1840, which are afterwards figured in his "Microgeologie." His figures of *Campylodiscus clypeus* have been frequently copied.

The Hungarian deposits were almost, if not entirely, unknown until the recently published investigations of Herr Grunow, which, unfortunately, are not readily accessible to Diatomists, excepting by the purchase of the volume of the work (at a cost of 40 marks) in which they appeared. Having through the kindness of a correspondent been enabled to examine one of the most interesting of them, viz. that from Dubrávica, I have identified most of the species named in the list which accompanied the sample. The deposit is somewhat delusive; from its general appearance we should suppose it would be easily cleaned; but this is not the case; when boiled in acids the material split up into thin laminæ of sufficient tenuity to allow of mounting without further manipulation; to separate the diatoms a careful boil in dehydrated soda is necessary to dissolve the silicic acid which cements the diatoms together. This cementation

seems to indicate that the deposit is of ancient origin, and this is further confirmed by the appearance of the Diatoms; although no new genus has been observed, and not more than three or four new species. Many of the forms have an old world look, and exhibit minute differences from those of more recent times.

As this deposit will perhaps become better known, and, as before observed, access to Herr Grunow's original paper is somewhat difficult, I propose giving a list of the new species and varieties, and figures of three of the most remarkable.

Cymbella abnormis, var. *antiqua*, Grun.; *C. austriaca*, var. *prisca*, Grun., var. *excisa*, Grun.; *C. gastroides*, var. *neogena*, var. *dubrávica*, var. *crassa*, *C. lanceolata*, var. *cornuta*; *C. sturii*, Grun.

S. intermedia, Grun.; *S. brevistriata*, var. *subacuta*, Grun.

Surirella clementis, Grun. Valve linear-lanceolate, gradually constricted towards the apices, slightly cuneate; alæ almost obsolete; canaliculi marginal 9 in. ·001"; centre of valve with a slightly elevated ridge or median line not reaching the apices, and terminating in short and sometimes curved spines. Length of valve, ·0040 to ·0048; greatest breadth, ·0012" to ·0015"; breadth at centre, ·0006" to ·0008".

This very remarkable form approaches in general appearance very near to the genus Cymatopleura, but a careful examination shows that its proper position is in with the Surirellæ. The inflations so conspicuous on the frustular view of the species of the former genus are absent, and in their place alæ

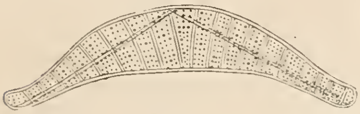


Fig. 40.—*Epithemia cistula*, 600/1.

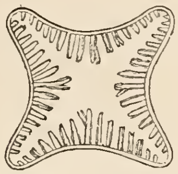


Fig. 41.—*Staurosira Harrisonii*, var. *amphitetras*.

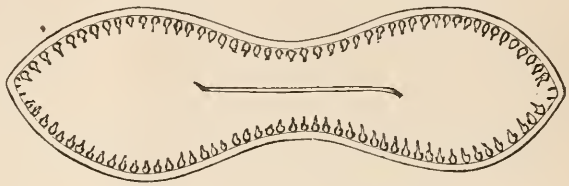


Fig. 42.—*Surirella clementis*, 600/1.

may be detected, and also a spinous median line. This species is not uncommon in the deposit. *Synedra ulna* (Ehr.); *S. delicatissima*, W.S.; *S. familiaris*, Kg., var. *neogena*, Grun.

Epithemia cistula (Eh.) var. *lunaris*, Grun. Valve arcuate, ventral margin slightly rounded opposite the turgid dorsum; ends produced slightly inflated; costæ distant; irregular striæ moniliform. Length, ·0020 to ·0030.

Herr Grunow considers this form to be a var. of *Ennotia cistula* (Eh.). I have examined Ehrenberg's figures of this species (of which there are several in the "Microgeologie"), but cannot see any resemblance between them and the above-named variety.

Navicula nobilis (Eh.) Kg., var. *neogena*, Grun.; *N. viridis*, Kg., var. *semicruciata*, Grun.; *N. impressus*, var. *semicruciata*, Grun.; *N. modesta*, Grun.; *N. decurrens*, var. Eh. var. *subsolaris*, Grun.; *N. haueri*, Grun.; *N. radiosa*, var. *dubravicensis*, Grun.; *N. gastrum*, var. *styriaca*, Grun.; *N. clementis*, Grun.; *N. tuscula* (Eh.), var. *ornata*, Grun.; *N. elliptica*, var. *grandis*, Grun.; *N. ventricosa*, var. *truncatula*; *N. informe*; *N. crucicula*, var. *protracta*; *Peronia antiqua*, Grun.

Staurosira Harrisonii, W. S. var. *amphitetras*, Grun. Frustule linear, valve quadrangular; sides concave; apices produced, rounded; striæ costate; length of sides ·0015, fig. 2.

This charming little form is rare in the deposit. The type form is, however, common.

Nearly all the Synedras are more or less distorted, apparently caused by pressure, and not by any teratogenic influence exerted during the development of the frustules.

Norwich, July, 1884.

A FREEZING MICROTOME.

IN reply to E. Lamplough, I have tried many forms of freezing microtomes while working in the Strassburg laboratories, and got by far the finest sections of soft tissue by using the one described below, which was made from descriptions of one which I am told is in use in Dr. Klein's laboratory. The freezing vessel consists of a small wash-tub, twelve inches diameter, by three and a half inches deep. Get a cover made of wood on which is cemented a plate-glass top with a hole cut in the centre, one and three-quarter inches in diameter; out of this hole projects slightly a brass or iron grated top. (on which the tissue is frozen), this top rests on a hollow pillar screwed on to the bottom of the tub, and this pillar is honey-combed with holes, to give free access to the freezing mixture with which the tub is filled, viz., ice and salt. The microtome is made on the principle of a joiner's hand plane, and consists of a metal frame (brass is best) to hold three large and fine threaded screws, A, B & C, which are

exactly like those used for adjusting a theodolite. The razor blade can be made by any blacksmith accustomed to fine work, and must be made of the best steel; each end is clamped to the frame by a strip of brass, and two screws subsidised by indiarubber. The way to use it: fill the tub with ice; sprinkle on salt; screw on the lid; put on the tissue on the grating which will be hard in five minutes; adjust

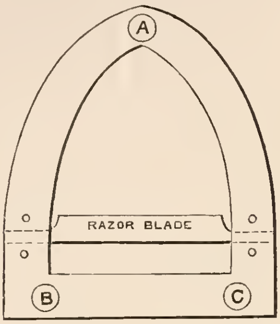


Fig. 43.—Freezing Microtome. Plan of top.

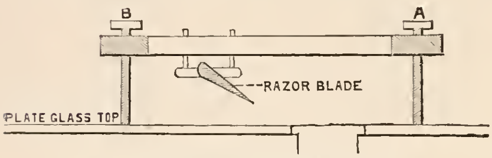


Fig. 44.—Section of Freezing Microtome.

the microtome by means of the three screws, A, B & C, until the razor blade touches the tissue plane a slice off, then lower the point by giving A half a turn, plane off another section and so on. I have heard it recommended to tip the screws, A, B & C, with ivory, so that they would slide better on the plate-glass cover, but I found the brass ones work beautifully.

Plymouth. B. Sc.

THE ORIGIN OF DOUBLE FLOWERS.

AFTER reading the papers on double flowers in Science-Gossip recently, I felt encouraged to talk about them to my neighbours, one of whom showed me a bed of double stocks raised from the seed of a solitary plant with single flowers, which, growing in an isolated spot, had probably received no pollen from the flowers of other plants. Here and there a plant with single flowers might be found among the lot I saw, but, besides being comparatively few, the plants bearing single flowers were small and weakly. The next gardener that I saw showed me two zonal pelargoniums with double flowers. He said that he had raised those plants from seeds, the produce of a single flower, with which he had not interfered, nor did he think that any insect had cross-fertilised it. He had found three ripe seeds and sowed them. They all germinated, but one seedling plant had died. The other two grew to maturity, and each of them bore double flowers. Thus we see how double flowers appear on plants under cultivation without conscious effort on the part of the happy gardeners who raise them. When a plant appears which pleases its owner more than others he takes the seed from that particular plant and sows them apart from other seeds. If the plants raised from such seeds are grown together, so that their flowers inter-cross, the effect of such inter-crossing is not like that of crossing freely with other plants not so nearly related, but tends to fix any character by which a variety may be distinguished from the species. Florists often keep apart the seeds of such a plant as they like best, having first been careful that its flowers should not be crossed. So, without knowing or intending it, they make arrangements for the appearance of double flowers. A striking difference appears however between the solitary plant with double flowers occurring among a lot of seedling sweet williams and the two plants of zonal pelargonium, each having double flowers, with no single flowered seedling by their side. If the theory of Mr. Mott be right, it would not be likely that so many double flowers would appear among the offspring of a young plant like Mr. Sim's sweetwilliam as among those of an older plant under similar conditions. Now it is well known that zonal pelargoniums are extensively propagated by cuttings which retain the character of the individual plant from which they are taken, and survive for many years to be like Moses in his old age, when the natural force of his strength was not abated. If the flower of such a plant be fertilised by its own pollen, or by that of another flower on the same plant, or on any plant derived from a cutting of the same stock, nothing would be more likely than that plants grown from seed so generated would bear double flowers, as it seems they do. If Mr. Sim's sweet william be kept for so long as it may live in a state of isolation, so that its flowers be not crossed with strange pollen, it would be interesting to know whether the plants raised from its seed would bear an increasing number of double flowers as the plant grows old.

John Gibbs.

Curious conduct of Pigeon.—My attention was called to a rather novel bit of Natural History on Monday 6th January. It was in the conduct of a pigeon playing and splashing on the water, enjoying itself as if it was in its natural element. The same thing occurred on Tuesday and Wednesday. When it was startled it rose with perfect ease and flew back to its loft. I can testify to its having been the same pigeon on all three occasions. Can any readers assign a reason for this occurring?—*A. W. Fry.*

ZOOLOGICAL NOTES FOR 1884.

LOOKING over my last year's notes, I find one or two which may be worth preserving. My knowledge of the literature of the subject is not large enough to enable me to judge of their general value.

(*a.*) Late in the summer, the vital fluids of insects seem to become inspissated, in the same way as those of leaf-petioles. Hence they may be touched when at rest, before able to summon sufficient energy for flight.

(*b.*) During the summer, I observed in some marshy ground by the upper Thames that an atrous *Limax* was attached profusely to the stems of a rush, whose black flowering spike was distantly similar. Is this mimicry, and if so, to what end ?

(*c.*) On February 15th, after a fire, for the first time since the autumn, had been alight an hour or two in a room, a blow-fly emerged from its pupa-case, and stayed in the room for four days, although doors and windows were constantly open. The cold air would seem to have formed an impenetrable barrier.

(*d.*) Out of an incomplete brood of *P. rapae*, which perfected early in May, ♀ were the last to emerge, and ♂ the first, the percentage of ♂ was 22, and in the course of a confinement of some two or three weeks, all of them died, without having made any attempt at coition, the ♀ surviving hardily. This would point to ♂ as the subjected factor in lepidopterous social life.

(*e.*) A lepidopterous larva, not full-grown, having been inadvertently kept in an air-tight box for 24 hours, commenced to pupate, with the apparent object of preserving its life. When released, and placed with its food-plant, it still proceeded with the work of pupation. Bees confined under similar circumstances having died, it would appear that larvæ respire less abundantly than perfect insects, and pupæ less still, if at all. Also that, when the process of pupating has begun, some internal re-arrangement of the larval parts takes place at once (cf. development of spinnerets), as a result of which larval growth cannot be resumed.

(*f.*) An unfortunate and unintentional experiment with a *T. pronuba* would show that the asphyxiating property of hydrocyanic acid fumes may be overcome if brought into contact with the poisoned specimen, especially if of robust habit in time. This may serve as a hint to keep up the strength of cyanide bottles, in order to prevent needless cacopathy. Thus this specimen, after being pinned out, was found three days after fluttering in full vigour, its wings being withdrawn from the pressure of the setting slips. Again, a *Spilosoma menthastri* laid 160–170 eggs after being stifled and pinned out, although this very common phenomenon is no proof of return to consciousness.

(*g.*) Observed a solitary bee on the wing one mile out at sea off the Norfolk coast. It did not secure the opportunity to rest afforded by the crab-boat whence it was seen. It being comparatively calm at the time, the journey must have been to some extent voluntary.

(*h.*) In the end of June a pupa of *C. ligniperda.* broke through its cocoon, which was buried in a flower-pot, worked its way some 3 inches to the surface, exserted the head-parts, leaving the abdominal parts of the case firmly embedded in the earth, and emerged in this way. Another specimen, whose cocoon was half-exposed, fixed its pupa case midway in the mouth of the cocoon while it emerged. Neither the uplifted case, nor the half-protected cocoon, was broken or crumpled by the weight of the moth. This is an interesting instance of adaptation to circumstances.

ERNEST G. HARMER.

NOTES ON HYDRACHNIDES.

MR. DRAPER'S beautiful illustration of Limnesia reminds one that a monograph of the British fresh-water mites still remains to be written, and therefore a description of the peculiarities of the sub-families Limnesia and Eylais, may be of some interest to the readers of SCIENCE-GOSSIP. These mites belong to Koch's second division Hydrachnides, and with regard to Limnesia, he says, "They are to be found in large and small pools, tolerably common, swim quickly without soon tiring, and are the richest in species of all the *four-eyed* water-mites." He describes twenty species: of these Hermann had previously described two, and Müller three. The mite Koch takes as his type of the species is *Limnesia fulgida*, and is, I believe, the one figured by Mr. Draper. The body is oval, smooth, very convex, of a beautiful, somewhat transparent scarlet colour, varied with darker markings produced by the cæca. Eyes four, in two pairs, each pair rather far apart, but the ocellus of each pair near together, forming an oblong figure thus—: ; Palpi and legs blue—the four hind legs are well endowed with long swimming hairs, and the tarsal joint of the hind legs is without claws. All the legs are used in swimming. The sub-family Eylais contains, according to Koch, but five species, and he remarks that they differ very little from each other. *Eylais extendens*, first described by Latreille, is the type species. The body is oval, but much broader behind than before, only slightly convex ; the skin velvety ; the colour vermilion. The eyes are placed rather near together, forming almost a square thus—: : and are arranged on a plate of chitin or thickened skin. The palpi and legs are of the same colour as the mite ; the last pair of legs has no long swimming hairs, consequently when the mite swims, these legs are not used, but dragged after it, in a peculiar and very characteristic manner, which alone, at once

distinguishes Eylais from all other mites; the hind tarsi also have claws. The differences between these mites are therefore sufficiently marked and numerous. They differ in the shape of their bodies, in the texture of their skin, in the position of the eyes, in the form of proboscis and palpi, and notably in the structure of their hind legs. The genital plates of Limnesia are also very characteristic; they differ in the various species, and will no doubt, when better known, be aids of great value in their discrimination.

When *Eylais extendens* is kept in an aquarium, or even in a wide-mouthed bottle, it lays large quantities of eggs of a brilliant scarlet; these produce a minute six-legged larva, not in the least like the parent mite; they are very active, running about apparently with equal ease on the glass or on the surface of the water, and no doubt become parasitic; but I have not yet discovered what is the host, although I have had scores of the eggs hatched at various times. With regard to the parasite of Dytiscus, I have been able to keep the beetle in an aquarium until the mite reached the next stage, when it detached itself from its host: it belongs to the sub-family Hydrachna, which is distinguished from all other Hydrachnidæ by having a long proboscis, almost, or quite, as long as the palpi.

C. F. George.

THE FOUR-SPINED STICKLEBACK.

Although it is well known that the four-spined stickleback, as well as many other fresh and salt water fish, is in the habit of building nests, it may interest some of your non-scientific readers if I give a short account of one which I have in an aquarium. Before I begin, I may mention that the individual to which I refer is darker in colour, and has the lower jaw more elongated than any of the others I have, and I believe is a male fish. He had not been twenty-four hours in the tank before he began to collect the finest fibres of roots, and to weave them among the fronds of a small hart's-tongue fern, and, after incessant labour for two days, he had constructed a beautiful nest about the size and shape of an elongated walnut. Having made the exterior, he then lined it with still finer material, until it was quite opaque, and at length put the finishing touches to it by crawling (I can call it by no other term) all over the outside until it was perfectly smooth. Having finished it to his satisfaction, he sallied forth to seek for a wife, and having set his affections on a female heavy with spawn, he chased her for half an hour, when having succumbed to his attentions, they swam quite slowly together up to the nest. Here they remained for a minute or two, when he put his mouth to her gill, and he appeared to lead her to the entrance, into which she went, and settled down into the nest. How long she would have remained there I know not, but, unfortunately, he bit her tail, which was projecting out, and she left the nest; and although he has been incessant in his attentions to others, he has not again been able to induce another one to enter. His time is occupied when not chasing other fish, in repairing the nest, constantly pulling bits out, and taking fresh material to it. Whenever he has been inside himself, his whole body stiffens and quivers with excitement. He is very pugnacious and jealous, and if an unfortunate caddis-worm or "boatman" comes near, he carries off the former bodily, and generally manages to frighten off the latter. Two stone loaches are objects of his particular hatred. If this simple account is worthy of a place in your valuable journal, I shall feel obliged if you will insert it.

A. H. Smith.

IN MONTIBUS SANCTIS.*

John Ruskin—Loquitur.

'Tis strange my form of scientific thinking
Upon the public fails to bite or hold;
My name with Art it ever will be linking,
Obdurate, deaf, to other truth, it's told.

Oft have I sought the Geological Society,
Of which I've been a Fellow for so long.
My great discoveries shook its cold propriety,
It treats me with neglect—'tis shameful—wrong.—

For with a little clay, and sand, and sugar,
The earnest student soon may make a trial;
And, in two jiffeys with some lugger mugger,
Learn geologic truths unknown to Lyell.

Oh, vain and foolish men, they cannot tell
How grew the stone on aldermanic finger,
Yet on "catastrophes of chaos" dwell
Or on the earth's creation longer linger.

For one and sixpence spent upon my teaching,
They'd learn how mountains crystal folds enclose.
How grew the faults,—a theory far reaching—
Like crystals how contortions first enclose.

How folds in agates do those truths express,
Which rub so much 'gainst geologic grain;
How all creation beauty doth impress,
While mine it is to make that beauty plain.

A Conifer.

At the monthly meeting of the Geologists' Association on January 2nd, Dr. Hicks (President) read a paper on "Some Recent Views Concerning the Geology of the North-West Highlands;" and Mr. J. Allen Brown, another on "Palæolithic Man of the Thames Valley in North-west Middlesex."

* Part I. "Of the Distinctions of Form in Silica."

NATURAL HISTORY JOTTINGS.

ON WASPS, CHIEFLY.

[*Continued from p.* 17.]

AUGUST 6th.—In another stone-faced earthen dyke there are two wasps' nests, one of which belongs to the *Vespa sylvestris* and the other to the *V. rufa*. In the former there are males and large females or queens present, as well as the workers. In the burning-out of the latter no queen was obtained, and only one male; but both may have been present in numbers exceeding one, and been destroyed in the destruction of the nest.

In a small meadow of barely four acres, the hay of which has shortly been cut, there are no fewer than six nests of wasps, three of which are built in one of the dykes and three in the ground. Of the three nests in the ground two belong to the *Vespa vulgaris* and one belongs to the *V. rufa;* and two of them, one pertaining to each of the species, are well out into the field, the third being much nearer the hedge. Of the three in the north dyke of the field, on its southern side, one pertains to the *V. rufa*, one to the *V. sylvestris*, and one to the *V. vulgaris;* the first-mentioned being the westernmost, the second within twenty paces of it to the east, whilst the third will not be much more than the same distance from the second nest. On the western side of the first nest, that of the *V. rufa*, and only nine paces from it is a small nest of the common humble-bee (*Bombus terrestris*) situated behind the facing stones of the dyke, as are also the nests of the *V. sylvestris* and *V. vulgaris*, that of the *V. rufa* being at a point where there are no stones; and nearly in the middle of the field, in the level ground, is a nest of the orange-tailed humble-bee (*B. lapidaria*). The meadow is a moist one, and is overrun with the water-rat or vole (*Arvicola amphibius*) and the field vole (*A. agrestis*), being in many parts literally riddled and furrowed with the burrows and runs of the former quadruped; the abundance of these two species of vole, not only in this particular meadow, but also in other of the meadows and pastures around, will probably account for the apparent ease with which the various colonies of the four species of wasp and the two species of humble-bee enumerated have been established, and consequently in part for their abundance there.

Standing by two of the nests that are built in the ground, one of which belongs to the *Vespa vulgaris*, and the other to the *V. rufa*, both nests being large and strong ones, I observed that at both the worker wasps were very busily engaged in bringing up out of the nest-cavity pellets of earth and small stones, and flying away out of sight carrying them in their mandibles. These pellets were frequently of the size of a small pea, and then were with difficulty borne away, the wasp not seldom striving vainly for a longer or shorter period being able to take wing with its burden. Sometimes the pellet proved altogether too large or heavy to be thus carried off, when the *V. vulgaris* would carry it down again into the nest-cavity, possibly to store it in some recess to be there found, the entrance to the nest being small and direct from the surface, not recessed at all; and once I observed a wasp of this species bring up out of the cavity a large thin wedge-shaped piece of stone or brick which was too heavy to be borne away, and which was also again carried down into the burrow. In the case of the *V. rufa*, the pellet when too large or heavy was deposited on the sides of the rather large recess at the entrance or mouth of the burrow; this nest being only a little distance underground. The nest of this latter species contained many of the large females, or queens, as well as males; and its shell or case was composed of thin, fine in texture and moderately tough paper laid on in large sheets, not in small convex, coarse, brittle, shell-like pieces, as was the nest of the former, which contained neither queens nor males, or drones.

August 9th.—This forenoon, as the wind blew a gale from the west, and there were alternations of sunshine and cloud and scuds of rain, the nest of the *Vespa sylvestris* was successfully taken from the north dyke of the little meadow. It lay in a cavity immediately behind two of the facing stones, and much resembled another of the rounded grey stones, such as are much used in dyking, the entrance to the nest-cavity being a small hole between two of the stones lying in front of it. This nest was of the usual form, turnip-shaped; and it contained three tiers of comb, the second of which contained many large cells occupied by the large females, and, adjoining them, a few smaller ones occupied by males, all of which were about ready for emerging. There were also many of these large females or queens, as well as a few males or drones, in the nest when taken. In the comb there were also larvæ of all sizes from shortly hatched to about full-grown, as well as pupæ or nymphs in all stages of evolution; but I only observed one ovum. Such was the force of the wind, that, standing on the windward side of the nest, there was little danger of getting stung, as the wasps could not cope with the gale blowing; and the occupants of the nest, after it had been dislodged and removed out into the open field, were easily knocked down and secured.

August 18th.—A nest of the *Vespa rufa* taken at dusk this evening out of a stone-faced earthen dyke, on its southern side, contained three tiers of comb, and many of the large females or queens. This species of wasp is either remarkably mild in disposition, or it is comparatively lethargic, as not one of them flew at us whilst taking out the nest from a cavity behind the stones, cutting it up and extracting the comb: from prior experience in the taking of the nest of this species, in the bright and hot

sunshine, I am inclined to ascribe to it the latter characteristic. The roundish hole of entrance and exit in the case or shell of this nest was on one side down towards the bottom of it; in the small nest taken on the 3rd inst., it was immediately in the centre beneath.

In the same dyke, at no great distance from the site of the above nest and each other, are two nests of the *V. vulgaris*, whilst somewhat farther off is a third nest. All the three are strong and in full vigour, as are also several other nests of the *V. vulgaris* known of. The latter species of wasp is (the *V. Germanica*, perhaps, excepted) the most agressive and persistent in its attacks upon intruders. If you once disturb it at its nest, you cannot again with safety tamper with, or indeed go very near the nest; and in its attacks upon an aggressor it hurls itself, as it were, against him, and sticks to him: it has to be struck off, and is apparently wholly fearless.

CHARLES ROBSON.

Elswick, Newcasle-upon-Tyne.

SCIENCE-GOSSIP.

MR. C. H. HINTON, B.A., has written a pleasant and lively *brochure*, entitled, "Scientific Romances: What is the Fourth Dimension?"

IN the "English Mechanic" we are pleased to see that Dr. Van Hewick and Dr. Royston Pigott speak in the highest terms of Mr. E. Hinton's "Diatomescope" as an aid in defining the markings and striæ on diatoms, &c.

WE have received No. 2 of "The Albertian," a magazine got up by the boys of Framlingham College. The ability which we noted in the first member is equally evident in the present. The interest displayed in science is very striking. Two of the papers, "A Scene in Autumn," and "A Holiday Week in Derbyshire," show considerable natural history knowledge.

PROFESSOR MÖBIUS says that flying-fish are incapable of flying, for the simple reason that the muscles of their pectoral fins are not large enough to bear the weight of the body aloft in the air, and that what has been mistaken for a rapid muscular movement of the fins is only a vibration of the elastic membrane.

A STATEMENT is made in the "Colonial Mail" to the effect that insects avoid the ground where tomatoes grow. Have any of our readers observed this? If it is correct, the information is valuable.

THE recent appearances of the sun-glows, at precisely the same period as last year, is regarded by Professor Landerer as an argument in favour of their cosmical rather than of their volcanic origin.

PROFESSOR RAY LANKESTER maintains that the "comma bacillus" of Dr. Koch is not a bacillus at all, but merely the segments of a *Spirillum*, the result of the breaking of a spirillum into little pieces, each piece corresponding to a turn of the spire.

THE Trunk Telephone Line between London and Brighton was opened the day before Christmas Day, and was duly celebrated by a dinner at each end, so that the two dinner-parties enjoyed each other's speeches, songs, &c., through the mediumship of the line.

SIR LYON PLAYFIELD will be the President of the British Association Meeting, which will meet at Aberdeen on September 9th.

MR. E. B. KNOBEL, Secretary of the Royal Astronomical Society, writes from Bocking, Braintree, under date January 6: "Encke's comet readily picked up this evening, near computed place; faint, with slight condensation of light."

AT a meeting of the Superintendents of National Education, at Washington, Dr. B. Joy Jeffries read a paper on colour blindness, urging that the three primaries are red, green, and violet; that blindness to the latter is so rare that practically colour blindness means blindness to red or green; urging also the danger of persons with such deficiency being employed in many occupations, and the necessity of an experimental method of finding it out.

COLONEL BERKELEY who has lately returned from the Andaman Islands, fished up, with the assistance of sixteen men, a very large bivalve *Tridacna gigantea* shell, which weighed 232 lbs. The inside measurement of one side of the shell is 1 yard 6 inches, and of the outside 1 yard 8 inches. The inside is of a beautiful delicate white. The mantle of the fish, when taken out, was a beautiful blue colour, and the fish made a sufficient meal for the sixteen men and their families. The shell is now in England.

THE wing of a fossil cockroach has been found in the Silurian sandstones of Jurques, Calvados, France.

MR. W. H. CHARMAN writes to say that on Christmas Day last, he found a total of no fewer than 90 species of plants in flower (of which he has sent us a list), within a radius of a quarter of a mile from Heath End nursery. On the preceding Christmas Day he found 75 species in bloom in the same locality.

A PROPOSAL to connect Sicily with the mainland by a submarine railway from Messina to Reggio has been made by the Engineering Society of Venice.

IT is a notable sign of the progress which science is making in the public mind to observe that this year the *Times* and other newspapers gave a long review of scientific discovery in 1884.

The Royal Society has made arrangements to obtain a Photographic Atlas of the stars of the southern hemisphere. It will be under the supervision of Dr. Gill, Astronomer Royal at the Cape.

Dr. C. Callaway has shown that the views recently published by Professor A. Geikie concerning the extraordinary thrust of old rocks on to newer strata in Sutherlandshire were published by himself as far back as the "Geological Magazine" for March 1883.

Mr. Wm. Tylor has brought out a simple and clean method of using balsam. It is enclosed in compressible metal tubes, like those containing moist colours, so that the smallest quantity can be expelled at will.

MICROSCOPY.

Clearing Fluid for Vegetable Tissues.—When freshly cut, put the tissues in alcohol for a few minutes. Then transfer them to a clearing fluid consisting of absol. alcohol, and eucalyptus oil in equal parts. After remaining in this fluid for ten minutes, place them in pure eucalyptus oil, to remove the alcohol. Then mount in glycerine jelly.—*Dunley Owen, B.Sc.*

Staining Vegetable Tissues.—It seems from last month's Science-Gossip that one of your correspondents was under the impression that I was quoting the method there mentioned as my own. I therefore wish to inform him that I had no intention of the sort, but unfortunately omitted to state that it was quoted from Messrs. Cole's "Methods of Microscopical Research," part xi. for June 1884. It is also mentioned in other papers, and one good method which I thought would be of use to querists. —*W. P.*

Cloudy Mounts.—The cloudiness alluded to at p. 18 arises from a minute quantity of moisture remaining in the tissue, which, as soon as mounted, disperses in the form of microscopical bubbles through the balsam. If W. H. L. will look at the cloudiness under $\frac{1}{8}$in. O.G. he will see that it is so. The fault can be corrected by dehydrating the section (see Cole's "Methods of Mounting"), placing it first in methylated spirit, then for a few seconds in pure alcohol, and then in oil of cloves, when it is ready to be mounted in the balsam. I next get rid of superfluous oil of cloves by placing the object on a bit of clean note paper for half a minute. Blotting-paper (which I have heard recommended) is the worst possible for this last purpose, as it goes off its fibres.—*H. W. Lett, M.A.*

The Royal Microscopical Society.—The Journal of this Society for December last, besides the ably-condensed summary of current researches relating to Zoology, Botany, Microscopy, &c., contains the following papers—"Description and Life-History of a new Fungus (*Milowia nivea*), illustrated by G. Massee"; Notes on the Structural Character of the Spines of Echinoidea," by Professor F. Jeffrey Bell; and "On some Photographs of Broken Diatom valves, taken by lamplight," by Dr. Jacob D. Cox.

Lantern Illustrations.—I fear E. W. will find some difficulty in obtaining what he requires, unless he is ready to pay for the oxy-hydrogen light, and to put up with all its inconveniences. But, as a step towards carrying out his desires, I may refer him to my direct vision camera, as described in the "Quekett Journal" for May last, p. 560. This might be enlarged so as to show imagos fairly well up to 2 feet, according to the object. If E. W. is in London, I shall be happy to see him at the Hackney Society's meeting on the 4th February, when I shall be repeating this demonstration.—*J. D. Hardy.*

ZOOLOGY.

Helix concinna.—In my list of Maidenhead shells in the December number, I forgot to mention *H. concinna*, of which I got one specimen. On page 19, it is stated that I found *H. rotundata* v. *alba* at Addington, in Kent, but on looking at my map I find that Addington is just on the Surrey side of the border between the two counties.—*T. D. Cockerell, Bedford Park, Jan.* 3.

Amalia Gagates.—A few days ago I found some slugs at Acton and Bedford Park, in Middlesex, which Mr. Roebuck, of Leeds, has identified as *A. gagates* var. *plumbea*. This species is, I believe, quite new to the London district, the nearest records I can find being Hastings and Christchurch. With the gagates I found *Amalia marginata*, type and v. *nigrescens*; *Limax agrestis*, type and vars. *tristis* and *sylvatica*, *Limax flavus*, *L. maximus* v. *subunicolor*, *Arion hortensis*, and others.—*T. D. A. Cockerell*, 51, *Woodstock Road, Bedford Park, W.*

Night Heron in Scotland.—On the 14th November last, a fine specimen of the Night Heron, (*Nycticorax griseus*, L.) was presented in the flesh to the Kelvingrove Museum, Glasgow. The bird, which was a female in immature plumage, was caught a few days before by Mr. W. Anderson Smith, of Ledaig, at Loch Creran, in Argyleshire, and was in a somewhat exhausted condition, having been probably blown out of its latitude by the severer storms prevalent at the time. The species may be considered rare in Scotland, where, since Jardine's time, there are only seven examples recorded as having been taken, this being the eighth and the first from the West Highlands of Scotland. It is a species having a wide distribution, being found in both the Old and New World: the latter was said to possess a species differing from that

found in Europe, but which has now been proved to be merely a climatal variety of a slightly larger size, but not differing in colour.—*J. M. Campbell.*

Rossia macrosoma (*Delle Chiaje*).—This interesting little squid is of rare occurrence on our shores, and has not, as far as I know, been observed in the West of Scotland. During last summer a specimen was taken in Loch Creran, Argyleshire, by Mr. W. Anderson Smith, of Ledaig, and by him presented to the Kelvingrove Museum, Glasgow.—*J. M. Campbell.*

Daubenton's Bat in Renfrewshire. — On Wednesday evening, 20th August, 1884, Mr. Stewart, George Street, Paisley, when insect hunting at Cragienfeich, near Paisley, caught a bat in an insect-net out of a flock, which on examination, proved to be Daubenton's bat (*Vespertilio Daubentoni*). I received the bat alive from Mr. Stewart, which I kept for some time, and the following are observations on its habits. For food it got fragments of raw mice flesh, pieces of tinned salmon (of which it was very fond), and flies. Each fragment of food was seized with a sudden jerk, and often with a peculiar file-like cry. In masticating it moved its jaws very rapidly—so much so as to produce an optical illusion. It was very fond of drinking, either water or milk, which, from a teaspoon, it lapped with its tongue like a cat, but rather quicker. It generally suspended itself in its cage by the hind feet, and the head downwards; and in that position dressed its wings with its tongue, and with one of its hind feet combed its fur. After the bat was kept in the cage for some days, it was set at liberty in the house. It often crept on the floor on "all fours," moving amazingly quickly from place to place with an odd hobbling motion. From the floor it often arose to wing with graceful ease. Its flight was but moderately quick. During the evening and forepart of the night, it spent much of its time on wing, hunting house flies. It was a noble hunter, only killing the flies when they were on wing. When it found the flies resting on anything, it set them to flight by bringing its wings close and suddenly past them. At first this method set the flies to flight; but latterly they were less willing to rise, as if they knew their fate. On the evening of the 27th August it took a large fly, and alighted on my shoulder, where it ate it all save the wings. It was seldom observed to eat the wings of flies. I would recommend the use of this bat for keeping down house flies, but it has somewhat of a disagreeable smell. Once or twice it hid about the top of my bed, and its whereabouts were unknown; but on the return of night it came out on wing. When thus hidden, it came forth about 3 P.M., on the 1st September, when it was nearly dark, on the approach of a heavy thunder rain. On the 28th August its weight was 2·125 drams, avoird. On the 7th September it was found dead, hanging in its cage by the hind feet, after being eighteen days in captivity.—*Taylor, Sub-curator, Museum, Paisley.*

BOTANY.

Nepeta Glechoma.—The variegation is caused by an insect which burrows underneath the epidermis, and feeds on the soft cellular tissue of the plant, leaving the epidermis intact, and producing beneath it cavities; thus giving to those portions lighter colour than the rest of the leaf. I do not know of any work on the subject, and can therefore only speak from my own observations. I have seen it in other plants, but have noticed that it especially affects the *Nepeta glechoma.*—*Dunley Owen, B.Sc.*

A "Glastonbury Thorn."—On the 20th of November last, near Ipswich, I gathered a sprig of hawthorn in full bloom giving out its characteristic odour. The same branch bore both flowers and fruit. Being so near Christmas, I thought this was not an unapt illustration of how the "Glastonbury thorn" might have been developed, without the aid of any other miracle than those which are taking place every day around us.—*J. E. Taylor.*

The Botanical Record Club has published its Report for 1883, which will be gladly welcomed by all practical botanists, and prove invaluable to all practical botanists. It contains, in a compact and tabulated form, all the most recent "finds" in phanerogamic and cryptogamic botany.

"The Sagacity and Morality of Plants."—I am not alone in holding this view, or in advocating it; nor is the subject so far-fetched as some at first thought suppose. Thus at a recent meeting of the Linnean Society, Mr. Alfred Tylor read a paper "On the Growth of Trees and Protoplasmic Continuity," his chief object being to show the principles that underlie the individuality of plants, and to prove that plants have a certain sort of intelligence, and are not merely an aggregation of tissues responsive to the direct influence of light. Not only this, but that the tree as a whole knows more than its branches, just as the species knows more than the individual, and the community than the unit. The result of Mr. Tylor's experiments, which have extended over many years, has been to show that many plants and trees can adapt themselves to unfamiliar circumstances, such as avoiding obstacles artificially placed in their way, by bending aside before touching, or by altering the leaf arrangement so that, at least, as much voluntary power must be accorded to such plants as to certain lowly-organised animals. Finally, Mr. Tylor contends that a connecting system, by means of which combined movements take place, is to be found in the threads of protoplasm which unite the various cells, and that this connecting system is found even in the new wood of trees. He has observed that most new wood points upwards, but year after year it changes its position, showing great mobility even in old wood.—*J. E. Taylor.*

Botanical Ingratitude.—Mr. J. M. Macfarlane, of Edinburgh, has just given in "Nature" the result of his study of the pitcher plant (*Nepenthes bicalcarata*). Its flowers are diœcious, so that the services of insects are necessary to carry the pollen from one flower to the other. Mr. Macfarlane says that the same structures which by their secretions attract insects for aiding in fertilisation, also lure them to the fatal "pitcher," so that their dead bodies may help in the nutrition of the plant.

Abnormity of Plants.—In my garden last summer a few peculiar "freaks of nature" occurred. In a plant of the new tall French poppy the two peduncles, or flower stems on one plant, being united together at the top for about a foot, the stems being separate at the bottom for a few inches, the two flowers were perfect blooms, and the plant was a free growing one, unstaked or tied up in any way. The same kind of abnormality occurred to many plants in a bed of *Limnanthes douglasii*, one plant in particular having the peduncles united together so as to become an inch and a quarter in width, while of the usual thickness. This feature was also to be seen in the Canterbury bell. Can this be due in any way to the dry summer?—*J. C. S., Penrith.*

GEOLOGY, &c.

A Buried Valley.—In connection with the Mersey Tunnel, now so rapidly approaching completion, a discovery has been recently announced of considerable importance to geologists. It was expected that during the progress of the works evidence would be afforded on the question of the pre-glacial river valley which, it was predicted by Mr. T. Mellard Reade, F.G.S., so long ago as in 1872, would be found to exist below the level of the present valley of the Mersey. Mr. Reade's deductions were based upon certain borings at Widnes, and the upper reaches of the Mersey, revealing an unexpected gorge deep below the "drift," on which the town of Widnes stands, and connecting the rocky bed above Runcorn Gap with that below it by a regular gradient. The course of the pre-glacial river was presumed to be, in the main, identical with that of the existing river Mersey. It now appears that, at about 300 yards from the Liverpool side, the upper part of the tunnel intersects for a distance of about 100 yards a gorge filled with boulder clay, containing erratics. The clay is hard, and of the usual type of lower boulder clay elsewhere found resting on the triassic sandstone. Well-rounded boulders of granite, felstone, and greenstone were taken out of the clay. The rock through which the tunnel is cut belongs to the pebble beds division of the bunter sandstone, and was found to be remarkably free from faults. The tunnel is now, we believe, completely arched in under the river, all difficulties having been surmounted with entire success. The pre-glacial valley of the Mersey is now, therefore, an admitted fact. The discovery affords a very complete proof of the truth of Mr. Reade's theory, submitted over twelve years ago.

The Liverpool Geological Society.—The Proceedings of this Society for the last session contain the following highly interesting papers: "On a Section across the Trias recently exposed by a Railway Excavation in Liverpool," by G. H. Morton; "Experiments on the Circulation of Water in Sandstone," by T. H. Reade, "On Indented Pebbles in the Bunter-sandstone, near Prescot," by Dr. Charles Recketts; and the Address of the President (Mr. D. Mackintosh) on "The Time which has elapsed since the close of the Glacial Period."

Obituary.—It is with deep regret we have to chronicle the death of one of the most active contributors to field geology of modern times, Mr. S. V. Wood, of Martlesham, near Woodbridge. Mr. Wood's name is associated more particularly with Pliocene and Pleistocene geology, and only in our last number we recorded his new discovery of beds of crag age in Cornwall. In spite of his wonderful intellectual activity, Mr. Wood has for years been a great sufferer. Another geologist of note who has recently died is Mr. Alfred Tylor, brother of the distinguished ethnological writer and discoverer.

NOTES AND QUERIES.

Food of Tortoises.—In reply to an inquiry in your issue of Science-Gossip for November, from K. H. J. respecting the food of a land tortoise, I have found one thrive well on dandelions, grass, and buttercups, and even a few rose leaves. It sometimes took a little milk, but preferred water. Little food is required in winter.—*A. U.*

Late Swallows.—It may be interesting to note that on the afternoon of the 14th November, while walking in a lane near Exmouth, I saw about a dozen swallows (house martins). The day was fine and clear, and they were flying high above the tree-tops, evidently hawking for insects. On the 21st I again saw several swallows early in the day, not far from the same place. On this occasion some friends living near also observed them.—*E. S., Exmouth.*

Mounting Insects, &c.—I shall be glad of any and all information which will enable me to mount for the microscope the head of a spider and similar objects as an opaque preparation for reflected light preserving, without contraction, the natural colours and appearance of the head and eyes. Also, to know where the pure tin cells with caps or covers (of which I remember to have heard or read) can be procured.—*J. R. Brokenshire.*

A Hybernating Cuckoo.—One of the strangest tales about a cuckoo was recently related to me that I ever heard, and had it not been told me by a friend in whose veracity I have the most unlimited faith,

I should not have deemed it worth recording. Having requested my friend to write down the facts, I send them in his own words. "Remembering your request, I will now fulfil my promise to send you all the particulars I could obtain respecting the cuckoo that spent a winter in England. The bird was reared when young by hand from the nest, and became quite domesticated, flying in and out of the house occupied by a farm labourer, whose father was an invalid, who never left his room, and who prevented the bird being disturbed after taking up its place on a clothes peg over his bed, in which position the bird remained the whole of the winter, without moving or taking any food, apparently in quite a dormant state. In the month of April it flew away uttering the usual 'cuckoo, cuckoo,' and was seen no more. The bird on the perch was a familiar object to all who entered the cottage during that winter and continued to excite astonishment. This occurred some years since in the village of Humphrey's End, near Stroud, Gloucestershire." Surely some witnesses can still be found of such an extraordinary event amongst the residents of Humphrey's End, and your readers, like myself, would like to know what they have to say about this hybernating cuckoo.—*W. P., Shrewsbury.*

A White Sparrow.—On the 2nd of October last, I got from one of the porters at the railway station here a beautiful specimen of what may be termed a "white sparrow." It had been frequenting the station for some time back, and had been traced to its roosting-place in the goods shed, where it was caught at night by means of a lantern. Its head and neck is pure white, its breast and belly of a dull white, the forepaws of the wings pure white, the flight feathers of the usual colour, centre feathers of the tail white, its beak and legs of a very light colour with a faint tinge of yellow. I have kept it in a cage since I got it, and it is now getting very tame. —*A. F., Anstruther, N.B.*

Golden Eagles' Eggs.—The relation of a friend of mine has in captivity a female golden eagle that has this past season laid two eggs of which I am now the fortunate possessor. They are of the usual dull white colour, and one of them only has the reddish-brown markings on it which are rather faint; the other is almost a uniform dull white, with scarcely a mark on it. Would the fact of the eagle being kept in captivity have anything to do with the marks on the eggs? And is it not remarkable that an eagle kept in captivity should lay at all? Perhaps some of the numerous readers of Science-Gossip would kindly give me this information.—*A. F., Anstruther, N.B.*

Twin Flowers on same Stalk.—I have observed the same peculiarity as R. H. Wellington mentions in your issue of January, not only on dahlia stems, but on hellebore with purple flowers.—*S. A. B., Cushendun.*

Large Unios and Anodons.—My December note seems to have been a little misunderstood. I did not cite my $6\frac{1}{3}$ in. *A. cygnæus* as in any way extreme, specimens quite equalling the largest mentioned on p. 22 (9 in.) having been found profusely, I am told, in Victoria Park, London, a few years back. The record of *U. pictorum* up to $5\frac{3}{16}$ in. is most interesting as being by no means general. A critical synopsis of authenticated maximal lengths would form a valuable addition to future works on this subject, especially if accompanied by short notes of habitat, as bearing on the elaboration of shell-matter. Do the most prolific areas produce the largest forms as well?—*Ernest G. Harmer.*

Yucca.—Is it usual for the yucca to blossom out-of-doors in midwinter? At the present time three plants of one of the yucca species have each a fine spike. The heights are respectively, thirteen inches, fifteen inches, and eighteen inches, clear of the stalk supporting them. They have not developed into a panicle, nor, I should think, are they likely to do so. We have now (December 31st) had frost for a week, and yet the spikes are only slightly touched by it. These plants are to be seen on the south-east terrace of a house; the house coming between them and the sea. Birkdale is a suburb of Southport, about seventeen miles from Liverpool, and on the shore of the Irish Sea.—*H. M., Birkdale.*

The Anatomy of the Cockroach.—The authors of the most interesting and instructive papers upon the anatomy of the cockroach recently published in Science-Gossip would confer an additional favour upon your readers if they would describe the methods adopted by them in preparing the specimens from which their drawings were made.—*J. H. Moorhead.*

Lion and Tiger.—I should be glad if some zoologist would explain what appears to me a difficulty in natural history, and that is, placing the lion and tiger in the same genus (Felis), as they are so very dissimilar in many respects. The lion has a tuft on his tail. Mr. Dallas, in his Natural History, writes, "In the typical genus (Felis) the tail is much elongated, but destitute of a tuft, and the skin is almost always marked with stripes or spots." The tiger has retractile claws; lions have not. The cat family climbs trees—lions do not. The cats live in the woods, lions roam on the plains; besides, there are other differences between the two animals which will occur to your readers. I have talked this matter over with a sportsman, who was well acquainted with them in their native haunts, and shot many; he agrees with me that they should have a separate class. —*S. A. Brenan, Cushendun.*

Recent Suggestions.—Two capital observations or suggestions have recently appeared in Science-Gossip. One of these refers to the tide of bricks, mortar and plaster which is surging all around London, and which in its course threatens to so materialise the suburbs that scarcely any vestige of natural beauty or power will survive. Green fields, trees, wild flowers, &c., will rapidly disappear, and the wearied artisan, the rambler, the naturalist, will alike be deprived of their rural haunts of pleasure and instruction. Epping Forest has been preserved, thanks to the energy of some naturalist, or sportsman, I forget which; and now Highgate Wood with its flowers and birds, Hornsey with its pleasant landscapes and walks, Muswell Hill rich in the romance of geology, &c., are threatened with the inevitable. Even the very presence of houses in any considerable number seems deleterious to vegetation. During last summer I spent many weeks in Patterdale, perhaps the most retired and beautiful valley in all England, and I can amply testify to the lavish and beautiful efflorescence there to be seen. The wild roses, the campions, the fox-glove, the stitch-worts, the cranesbills, the wound-worts, the garlics, the burnets, &c., were exquisite in colour and of a larger size than those commonly known to townsfolk. The other suggestion, which I alluded to, refers to the establishment in a suitable part of London of a popular observatory. I understand that about ten years ago there did exist some sort of peep-show observatory some-

where in or near the Euston Road. How it managed to go "down the hill," is more than I can say; but that it was not a very remunerative concern seems evinced by the fact that, to my knowledge at least, nothing of the sort has ever been established since. We all remember what a fine show there was at the Education Department of the Healtheries Exhibition. In a mechanical point it seemed almost perfect; but nevertheless it is true that the scientific culture of the English public mind has proceeded much slower than that of most foreign nations. We read that during the eclipse of October last, the French Government provided in the streets of Paris a number of telescopes for the gratuitous use of the public. When will the British Government be so far actuated by British public opinion or feeling, or whatever it be, as to act in a similar manner?—*P. Quin Keegan, LL.D.*

SEWAGE SCHEMES.—In SCIENCE-GOSSIP for September there is an article on sewage which reminds me of a plan which is adopted with great success in Copenhagen. It is merely this, that there is a division by which the liquid is run off from the house into the drains. There is nothing in the smell from the residue; in fact, I could not perceive any in a large hotel in Copenhagen. The ammonia from the liquid is by no means injurious to health; of this we have had ample experience in Smithfield. Of earth closets—to make a slop as is done in earth closets, and then to put in earth to dry it up, seems a roundabout way to get rid of a nuisance. I have very little doubt, that (in crowded places especially) the Copenhagen plan will have to be adopted. Gas water contains considerably more ammonia than the liquid which is absorbed in the earth closets, and as this gas water is sold for less than a penny a gallon for heating sulphate of ammonia, such liquid as runs into the drains at Copenhagen is probably not worth attending to except in particular situations.—*J. G., Malvern.*

A MUSICAL MOUSE.—One evening in the summer of 1883, I noticed a mouse making a peculiar noise in the sitting-room of my house. The noise resembled that made by a kettle just beginning to boil, or a sort of low whistle, and was very clear and distinct. This singing (?) power appeared to be under the control of the mouse, for as the little creature moved about in search of stray crumbs over the carpet, it ceased occasionally, and also when alarmed, as the animal hurried off. I observed the little visitor hundreds of times afterwards, and it always made the same (by no means unpleasant) noise, when out in the room foraging. After some months, however, it mysteriously disappeared without apparent reason. A friend of mine informs me that this "musical" power, though uncommon has been observed before, and is the result of some disease to which the animal must have succumbed. I have also been informed by others, that it is a natural peculiarity. Would any contributor to this Journal kindly give a true solution to the mystery, or particulars of similar cases that may have been observed?—*S. H. Veale.*

BLACK RAT.—The black rat is still to be met with at most of the London docks, and, although it does not now occur so frequently as in years past, it can hardly be considered rare. The war of extermination carried on by the Norway or sewer rat against the black rat, means, that not only does it kill its victim but devours it too. A friend of mine employed at one of the docks, has occasionally found skins of freshly killed black rats, turned inside out, in various drawers, boxes, &c.; this seems to be the usual process with rats. For experiment I have given the carcass of a white rat, to a black and white variety, and observed the same result—only a few bones of the head remaining attached to the skin.—*F. W. Halfpenny.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

VICAR.—The "Popular Science Review" is not now in existence. It has been defunct about five years.

MISS L.—We do not insert exchanges gratuitously in which the word "cash" occurs. Those are "sales," not "exchanges," and have to be paid for as advertisements.

J. ELLISON.—Your shells are: 1. *Anodonta anatina;* 2. *Unio pictorum;* 3. *Unio,* sp. (?) (American); 4. *U. tumidus;* 5. *Paludina vivipara;* 6. *Limnea auricularia.*

G. SMITH AND OTHERS.—We will let our readers know concerning the proposed General Index in time. The last was published in 1876, price 8*d.* It included the contents of the first 12 volumes, and may be had of our publisher.

B.SC.—Thanks for the interest you take in our journal, but we think it would be a mistake to leave out the botanical names in the description of plants, &c., and give only the trivial names. It would open the door to considerable inaccuracy and misunderstanding.

C. G. D. (Guernsey).—Your Coralline is a very fine specimen of the Polyzoon, *Eschara foliacea,* not uncommon in the deeper parts of the sea off our southern coasts.

G. T.—The last edition of Carpenter's "Microscope" was published in 1883. It is a fine work, and will fully serve your purpose, and answer every question relating to practical microscopic work.

J. E. C., jun.—The last number of the Proceedings of the Geologists' Association was published in October, and may be had of E. Stanford, Charing Cross, price 1*s.* 6*d.*

J. M. B. TAYLOR.—Many thanks. All your notes will appear in due course.

W. J. J.—Rimmer's "Manual of Land and Fresh-water Shells" is the best. Nearly all the species are there photographed, price 10*s.* 6*d.* There is no regular work on the fossils of the chalk, but you will find a good deal about them in the various works of Dr. Mantell, ("Medals of Creation," 2 vols.; "Geology of the Isle of Wight," &c.), or in "Our Common British Fossils, and where to find them," by J. E. Taylor, which will be published in March next.

ALCHEMIST.—Meldola's "Elementary Text Books on Chemistry," are among the best used in connection with the South Kensington Examination. They are cheap, and published by Murby & Co. Apply to Messrs. Churchill, publishers, for information respecting an elementary text-book on Medicine.

R. CONNOR.—No sketches of objects were enclosed in your letter. If you will send them we will do our best to identify them.

A. SHAW.—We do not undertake to name foreign objects of Natural History. The shells shall be looked up and forwarded to you.

S. A. BRENAN.—The "fungoid growth" was a species of Nostoc—the so-called "Witch's Butter." Specimens sent to be named are not returned. The one you forwarded us was in a state of high decay when it reached us.

EXCHANGES.

WALLROTH'S (Latin) "Compendium Floræ Germanicæ" (1831), vol. iii., containing the rhizopterides, equisetum, ferns, lycopods, hepaticæ, mosses, and lichens, 654 pp., in strong pocket-book binding, to be exchanged for books or specimens illustrating the fungi.—W. B. Grove, 269 St. Vincent Street, Birmingham.

WANTED, SCIENCE-GOSSIP for February and March, 1884.—G. A. Grierson, 74 Market Place, Sheffield.

WANTED, to exchange with some one living in North Britain, mosses and hepaticæ from Gloucestershire. — E. J. Elliott, Middle Street, Stroud, Gloucestershire.

CEYLON insects, mainly lepidoptera, to exchange for other exotic lepidoptera or entomological micro. slides.— Surgeon Clements, Army Medical Staff, care of P.M.O., Ceylon.

OFFERED, a geological collection of from eighty to a hundred well-selected and named specimens for good chemical balance; or what offers in books either on geology, botany, chemistry, or animal physiology?—J. T. Backland, 93 High Street, Paisley, N.B.

WHAT offers in dried plants for *Ophioglossum Lusitanicum*? —Apply, Free Museum, Paisley, N.B.

WANTED, bats, any others than the common, long-eared, or Daubenton's bats, either skins or in flesh, for palmated smooth newt (*Lissotriton palmipes*), in spirit.—J. T. Backland, 93 High Street, Paisley, N.B.

UNMOUNTED spores of *Equisetum arvense* (very curious) for well-mounted slide or prepared material.—W. Sim, Gourdas, Fyvie, N.B.

DUPLICATES: *L. stagnalis* and *P. corneus* (very fine), *L. peregra*, *P. complanatus*, *P. spirorbis*, *D. polymorpha*, *H. pisana*, *H. lupicida*, var. *alba* of *H. virgata*, *H. caperata*, *H. arbustorum*, *H. ericetorum*, *H. rufescens*, *C. rugosa*, &c.— Desiderata very numerous, land, freshwater, and marine shells; also algæ.—W. Hewett, 26 Clarence Street, York.

Hæmatopinus atini and other well-mounted slides in exchange for lantern photos or micro slides.—Dr. Moorhead, Errigle, Cootehill, Ireland.

EIGHTEEN packets of unmounted microscopic material sent in exchange for one well-mounted slide and stamp.—M. B., 9 Kirkdale, Sydenham, S.E.

A LARGE quantity of British and foreign shells, minerals, &c., in exchange for a small white wood microscopical cabinet, glass door required, to hold 144 slides.—M. B., 9 Kirkdale, Sydenham, S.E.

WANTED, English, silver, and copper coins, tokens, and medals; good exchange offered in fossils and other objects of natural history.—F. Stanley, Margate.

WANTED, well-mounted slides of eggs of insects, moth eggs preferred; first-class slides in exchange.—George Timmins, Syracuse, N.Y., U.S.A.

WANTED, October, 1868, number of "Anthropological Review," a fair price, or a copy of "A Few Words on Zoology," together with "A Short Account of Giraffe," by J. H. Garfit, given in exchange; also Vogt, "Lectures on Man," English translation, if not very expensive.—John H. Garfit, The Cairns, Boston, Lincolnshire.

DUPLICATES: Rhamni, Cardui, Atalanta, Tages, Selene, Tithonus, Adonis, Corydon, *S. populi*, Oculea, Ulmata, Chi, Bipunctaria, Festucæ, Glyphica, Illumaria, Betularia, Comitata, Bucephala, Perla, Cæruleocephala, Menthastri, Auriflua. Desiderata: British birds' eggs, side blown, or butterflies and moths.—F. J. Rasell, 30 Argyle Street, S. James End, Northampton.

DUPLICATES: Io, Atalanta, Corydon, Cardamines, Linea, *S. populi*, Ligustri, *Z. Trifolii*, Potatoria, Bucephala, Betularia, Atomaria, Piniaria, Rhomboidaria, Perla, Instabilis, Cubicularis, Haworthii, Libatrix, Meticulosa, Oxycanthæ, Spadicea, Lota, Hybridalis, Cerella. Desiderata numerous. Accepted offers answered by return of post.—George Balding, Ruby Street, Wisbech.

BRITISH birds' eggs.—Duplicates: coot, moorhen, red-legged partridge, &c. Desiderata very numerous.—George Balding, Ruby Street, Wisbech.

WANTED, odd back numbers of scientific periodicals: SCIENCE-GOSSIP, "Nature," "Zoologist," "Journal of Conchology," &c. Will give in return a good series of British Shells.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

SHELLS for exchange: *L. glutinosa*, *A. acicula*, *Z. excavatus*, *Bulla hydatis*, *Lit. neritoides*, *Physa acuta* (from Kew Gardens), and many others. Wanted, Acme, Vertigo, and varieties of *nemoralis*, *hortensis*, &c.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

MICRO slides offered in exchange for scientific books and instruments.—Samuel M. Malcolmson, M.D., 55 Great Victoria Street, Belfast.

FOSSILS.—Over 400 specimens, miocene, eocene, chalk, lias, oolite, from Red Crag, Bognor, Barton Cliff, Shepton Mallet, Lyme Regis, and Portland; also a few mineral and rock specimens from Cornwall, in exchange for two pairs of canaries for breeding purposes, or Morriss's "British Birds."—T. Lawson, 9 Marshall Street, Golden Square, W.

OFFERS wanted in exchange for 240 birds' eggs, many varieties, both land and water birds.—Alfred Draper, Abbey Dale Road, Sheffield.

WANTED, microscopist's collecting case, net, &c.—A. Draper, 275 Abbey Dale Road, Sheffield.

WANTED, members for Botanical Evercirculator. Full particulars on application to—T. F. Uttley, 17 Brazennose Street, Albert Square, Manchester.

WANTED, back numbers of SCIENCE-GOSSIP, from commencement to date, to complete volumes. Send list of spare numbers for exchange to—T. F. Uttley, 17 Brazennose Street, Albert Square, Manchester.

SCIENCE-GOSSIP, clean, 1882, 1883, 1884, plates of "Graphic Microscopy." What offers?—John Kitchin, Grosvenor Place, Upper Parliament Street, Nottingham.

SCIENCE-GOSSIP, 1880 (unbound and in good preservation), for good scientific (natural history) book of same value.—Arthur Ayling, Tarrant Street, Arundel, Sussex.

OFFERED, "Scientific Recreations" (unbound and in excellent condition), for vols. ii. or iii. of "Science for All," or other good scientific books or periodicals.—Arthur Ayling, Tarrant Street, Arundel, Sussex.

WANTED, Continental plants in exchange for other Continental or English plants.—A. R. Waller, Low Ousegate, York.

1500 British moths (many rare), including 400 species, for exchange for a similar collection of British Coleoptera; also foreign butterflies for foreign Carabidæ and Longicornia.— Delancey Dods, 47 Chepstow Place, Bayswater.

MOST of the Longicornes and many of the Chrysomela and Geodephaga for exchange. Desiderata: marine shells, British and foreign. Lists sent.—G. Pullen, Free Library and Museum, Derby.

WANTED, fossils from Upper Miocene, Middle Eocene of France, Upper Miocene of Belgium and Germany, Solenhofen stone; also foreign land, marine, and freshwater shells. Offered, fossils and shells.—Miss Linter, Arragon Close, Twickenham.

POLARISCOPIC.—In exchange for any good micro photograph, I will forward a very beautiful slide of copper sulphate, showing circles on variegated ground.—Mathie, 42 McKinlay Street, Glasgow.

OFFERED, SCIENCE-GOSSIP for 1883, in clean separate copies; also with covers off for binding 1874 and 1875. Wanted, books on British Flora.—A. V., Mount Cottage, Red Hill, Surrey.

OFFERED, Black's "Three Feathers," 6*s*. edition, one vol., post free, for last number of "Popular Science Review," edited by Dallas, post free. Wanted, terms for this quarterly, second-hand, post free.—Vicar, Salcombe Regis, Sidmouth.

WANTED, to purchase a few specimens of flint implements (British).—F. Chams, 10 Broomfield Road, Chelmsford.

REPTILES in spirits, young crocodile, whip snake, viper, sea snakes, scorpion, centipede, &c., in exchange for flint and stone implements, or British birds' skins.—R. McAldowie, 12 St. Nicholas Street, Aberdeen.

GOOD specimens of British butterflies wanted in exchange for local British plants.—F. and C. Towndrow, 2 Commercial Buildings, Malvern Link.

WILL exchange a good selection of several hundred dried specimens of British plants, for restoration or Elizabethan dramas or poetry. Offers requested, silence negative.—W. Roberts, jun., Heamoor, Penzance, Cornwall.

OFFERED, "Illustrated Science Monthly," first two volumes, cost 10*s*.; wanted, botanical or other slides, lepidoptera, pupæ, &c.—S. M. Wellwood, 320 Duke Street, Glasgow.

Pinnules of *Neuropteris gigantea*, from the coal measures of South Staffordshire, given in exchange for other fossils.—A. M., Martin's Hill House, Dudley.

WANTED, good material for mounting, more especially insects (in spirit); also a quantity of any one insect (providing it is not common); well-mounted slides given in exchange.—C. Collins, 25 St. Mary's Road, Harlesden, N.W.

MICROSCOPIC slides, by Watson & Son, to exchange for others of similar value.—A. P. Williamson, Chapel Alberton, Leeds.

"LONGMAN'S Magazine," vols. 1–4; "English Illustrated Magazine," vol. i. (both unbound); Cassell's "Illustrated Readings," (2 vols. bound in one); offered in exchange for fossils, corals, shells, &c.—H. L. E., 34 Ling Street, Liverpool.

BOOKS, ETC., RECEIVED.

"Authors and Their Works," by Rev. Dr. Brewer.—"The Magic Lantern and its Management," by T. C. Hepworth, (both from Chatto & Windus). — "Midland Naturalist."—"Gentleman's Magazine." — "Belgravia." — "Science Monthly."—"Ben Brierley's Journal."—"Science."—"American Naturalist."—"Canadian Entomologist."—"Medico-legal Journal of New York."—"American Monthly Microscopical Journal." — "The Botanical Gazette." — "Revue des deux Mondes."—"La Feuille des Jeunes Naturalistes."—"Cosmos." &c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:— T. M. R.—G. T. G.—D. O.—J. D. H.—W. G. C.—W. R. P. —J. F.—W. R.—E. O. M.—J. C. M.—W. S.—J. R. B.— E. G. H.—W. T.—H. M.—T. H. M.—W. D.—Dr. P. Q. K.— E. W. O'M.—M. B.—J. E.—F. M.—F. S.—G. T.—J. H. G.— C. S.—F. J. R.—W. R., jun.—S. A. B.—W. H. C.—S. R.— S. M. M.—J. E. L.—T. F. W.—A. D.—W. W. B.—W. M.— T. L.—J. M'C.—A. V.—F. C.—W. J. B.—A. C.—W. M.— T. D. A. E.—S. C. C.—W. J. J.—R. McA.—J. G.—J. K.— A. P. F. G.—W. H. P.—D. D.—G. B.—A. A.—A. R. W.— S. H. V.—G. P. H.—W. P. C. C.—J. W. B.—C. G. De.— L. M.—J. B. M. T.—W. R.—A. M.—J. P. G.—H. W. L.— F. and C. T.—F. W. H.—J. C. S.—A. W. F.—S. M. W.— G. E. E.—G. S.—W. R. S.—W. T.—H. F.—H. W. M.—C. R. H. L. E.—J. E. C.—S. C. C.—A. P. W.—W. L. R. C.—&c.

E.T.D. del, ad nat.

Vincent Brooks Day & Son lith.

MARINE ALGÆ; POLYSIPHONIA ELONGATA.

× 50.

GRAPHIC MICROSCOPY.

By E. T. D.

No. XV.—Polysiphonia elongata.

WHEN plants were studied only in connection with their medicinal uses, the marine algæ escaped scrutiny, and were comparatively neglected and unclassified, the earlier systematic botanists scarcely recognised their existence, and it is only in recent times that algology has assumed the importance of a scientific speciality. This is undoubtedly due to the improvement in the microscope and its accessories. Without this instrument the beauty of many of the minute species, and certainly their structure and mode of fructification, could never have been completely approached, or understood.

In comparison with land plants, the sea-weeds differ greatly, and offer many characteristic peculiarities, depending on the medium in which they grow, influenced by abrupt changes of heat and light, affected by localization.

When botany became a science, sea-weed history arrested the attention of patient observers, and the dim horizon was illuminated by the researches (among others) of Greville, Carmichael, Agardh, whose labours were eventually consolidated, and enriched by Professor Harvey in the "Phycologia Britannica," 4 vols. 1846–51, the greatest work on the subject. It might be presumed that to supplement such results would be impossible, that nothing remained! But new varieties are yet to be discovered, and important facts traced and investigated.

Of the Florideous Algæ (red filamentous seaweeds), the families Delesseriaceæ, Ceramiaceæ, and Rhodomelaceæ, are the most delicate, and, under microscopic examination, singularly beautiful. *Polysiphonia elongata*, the subject of the plate, is a genus of the latter family, and exhibits a filiform articulated frond, the filaments interrupted at the joints by tubes sufficiently transparent to reveal the purple or pink contents. In this family the number of the tubes are distinctive of the genus. The circles of longitudinal cells surround a central axis, not unlike the wood bundles enveloping the pith of a Dicotyledonous stem, and very elegant microscopic objects are transverse sections of such fronds, showing the appearance of rosettes—these twisted filaments are covered with a thin cellular tissue; the disposition and arrangement of the cells of minute algæ, with the brilliant colour of the endochrome, in multifarious combinations, are amongst the most attractive objects of microscopical investigation.

The specimen figured exhibits a condition of fructification resulting in "ceramidia," cup-like or pitcher-shaped capsules, with membranaceous walls, thin and filmy, attached to the sides of the branches, and containing at the base numerous pear-shaped spores. The drawing was made from a permanently mounted preparation, necessarily somewhat flattened: but in a fresh condition, in a deep receptacle, the ceramidia show a more decided urn-like, or ovate condition; under other conditions, "tetraspores" are developed in the central cells of the fronds, and "conidia," and "antheridia," in elongated whitish sacs at the summit of the branches.

Specimens are frequently found on scallop shells, and at very low tides (after heavy weather) some rare forms may be collected, which, under ordinary circumstances, could only be procured by dredging. On a shelving coast terraced with rocks, it may be observed that the algæ near high-water mark are

stunted, scattered, and torn, and as a lower point is approached, not only greater variety, but more perfect specimens are discoverable, although the delicate genera thrive in deep waters unaffected by rough tidal influences; many depending for favourable development on comparative darkness, and continuous immersion, may be found in rock pools, and this condition is essentially the habitat of the polysiphonia.

Specimens of ceramium, lithothamnion, ptilota, and many others (exquisite objects under low powers) may be arranged or disposed for future examination by floating in a shallow vessel of fresh water, lifting them on conveniently-sized pieces of stout cartridge paper, and after superfluous water drained off, drying in beds of blotting-paper under gentle pressure. But for microscopic observation a selected portion may be at once placed in a shallow cell, in glycerine jelly covered and cemented by the usual methods. Growing specimens thrive for a considerable time in small glass vases, or test tubes; success depending on placing them in moderate darkness, and even temperature.

A very simple and useful addition to the "material" of a microscopist are pieces of ordinary glass (not too thick), three and a half inches square; between such plates, specimens capable of being dried and flattened without injury, as portions of fronds of ferns, zoophytes, wings and parts of insects, seaweeds, and many various objects may be temporarily stored, and thus protected from dust, or fracture. The glasses are held together by strips of gummed paper bordering the edges; the advantage being they can be examined on the stage of the microscope when it is desired to select any part for a permanent mount.

Crouch End.

NOTES ON MUSICAL MICE, &c.

MICE to which is given the characteristic term of "musical," or sometimes "whistling," or "singing," because of a peculiar sound that certain of them make, are known to the scientific world, as well as to many others. I have had one of these mice in my possession for some time, and the following are observations made on it. The scientific world, it would appear, is divided in opinion as to the music of the musical mice, whether it is the effect of disease, or a voluntary act. The property in which I dwell is new, and when I took possession of it in May last the tradesmen were not through with it, and then mice were not to be expected in the house, neither did I observe any in it, but from the 9th to the 16th June a flock of mice took up their abode in the house, probably driven hither by the taking down of an old property near by. The musical mouse did not make its appearance till 23 July, when, towards midnight, it came from under the grate, having probably made its way to the top of the third story behind the ceiling or in holes in the wall. I was at once attracted to the mouse by its cry. The mouse wandered from the fire-side and took up its abode below a chest of drawers—its whereabouts being well made out by its incessant music or cry. I drove it from this retreat; and got it into the dark lobby, where, in pursuing it with a lighted taper, I caught it with my hand. I may mention that I believe this to have been the mouse's first visit to this house, for, in moving through the house it looked so like a stranger, yet when they are suddenly exposed to light they get somewhat bewildered. Of this I have often taken advantage where they are numerous, as, for example, in a press or cupboard. I have quietly but suddenly brought a light into their presence, and in their bewilderment have taken them with my hands, either to get rid of them, or to have them for investigation. I put the musical mouse into a cracked water carafe, in the bottom of which was a small hole. To this new situation it soon became reconciled. In it it slept and ate, and when not sleeping it spent much of its time in dressing itself, which it did with great activity—sitting on its hind legs, with its tongue, like a cat, but double as quick, it licked the fur on its belly, and other parts, then licking its fore paws with its tongue, it would dress the fur on its face and its ears. During all these movements of itself, the music was kept up, which, as I observed at the time, and entered in my observation book as a "round-squeaking sound." The only time I ever observed the music stopped was when it got into a very deep sleep. Even when pursued to be taken, its musical cry was kept up, but only somewhat more rapidly, being caused, no doubt, by the greater frequency of its breathing through exertion, a fact that would seem to point to the cause of the music as some disease of the respiratory organs. In this water carafe it remained for over a week, and became a favourite with the children—it taking fragments of meat from their fingers, and, it may be added, drank from a teaspoon—lapping with its tongue like a cat, but much more rapidly. The children made somewhat free with the mouse, and took it from the water carafe in feeding it, when it made off, yet it never left the house. After its escape from the water carafe its cry or music became much changed, its note was not the same, and was over a double louder, so that its whereabouts behind the ceiling or otherwise was known. I often went and surprised it and others from the cupboard, from which it would jump making a dull thud on the floor, but the others darted timorously about to make off. After the mouse had been some time at liberty, I got a box trap and set, and after taking several other mice in it, the musical mouse was secured—and at its music as usual even in the trap. It was transferred from the trap to the water carafe, which it seemed to remember; and as the carafe was on the floor it had to be removed, and

to keep the mouse from getting out by the hole in the bottom of the carafe I put the palm of my hand over it, but to which the mouse made so free use of its teeth, that I had to set it quickly down when the cracked carafe fell in pieces, and the mouse was again free. It scampered somewhat awkwardly across the floor, keeping up its musical notes as it went and got under the grate. I again set the trap in the same place, but had not bright hopes of again getting the mouse, but, strange to say, it was in the trap again in not many minutes. I could hear the mouse go up behind the grate, and from hence behind the ceiling to the press where the trap was—its constant musical cry being so loud. This was on the 20th August, and it was kept and fed in the trap, till a cage was made for it, and into which it was put on the 23rd. A younger and smaller mouse was put into the cage beside the musical mouse on the 24th, with which at first there was a fight, but soon afterwards both were on good terms and remained together till the 27th, when, through the opening of one of the wires both escaped. The same day the trap was re-set, and by night the musical mouse was again in it, and was put back to its cage, and in which it has remained to the present time (8th November). During this time the mouse has been in my possession its note has undergone considerable change, and has even at times been stopped. The following is an extractive summary from the observations :—On 25th August its cry during the night like a young chicken when warm under its mother's wing—i.e. "*wet, wet,*" the vowel being sounded as in "*eat.*" On morning of 26th, a friend came to see it, but he was not favoured with its music; it was aroused from its sleep, but he was not long gone when it began. On 27th two other mice put into the cage; all agreed well, only they were allowed a second share of the food as long as they remained in the cage; 28th, the musical mouse quite tame, and spends much of its time biting the wires of its cage; 29th, little music; its hair sickly looking; at 1.30 P.M. all three in a cluster sleeping or resting. September 1st, the other two mice escaped, and the musical mouse in great activity. 2nd, resting and very inactive. September 7th, it now takes very sound sleep during the day, when it is silent, but at night, when out, its note is considerably changed, being something like the croak of a frog, or *cok-cok-cok-cok*, in quick succession. About 10th, rests much; not so much music; hair getting drier, and its back somewhat bent up. October 19th, silent during day and night, but on 20th at a great height—crying in its nest, and during the evening very loud, but ate cheese and drank milk very lively; again on the 26th, in the evening, had a violent and sudden attack; its cry loud and rapid, and its body with rapid breathing terribly convulsed; I offered it some cream which it lapped from a teaspoon, and was relieved. At present (November 8th) the creature is still alive and active, but little of its music is now heard, but when the ear is brought near it a complicated wet-ing sound is heard in its breathing. The mouse is the common one, *Mus musculus*, a female having six teats, in size moderate, but for this locality would be called large where mice are smaller than in districts where oats are more in use. The inside of the mouse's ears is partly covered with warts, akin to what I have often observed on sick and dying rats in both town and country. The above observations, I think, point to the cause of the music as being the effect of disease connected with the respiratory organs. Another item that favours this is its great fondness for fat or butter.

Looking on disease as the cause of the so-called music in our "musical," "singing," or "whistling" mice, we may look around ourselves and consider the extent to which such a disease prevails among mice. In London musical mice have often been exhibited. In vol. i. of the "Zoologist" (1843), there is a lengthy notice of one, and again in vol. vii. (1849) there are two described as "whistling" mice, and in the same an extract is given from "A paper on the study of Natural History," by W. D. King, where he says "much has been written of late years" on them, and he says the music of the mice is a voluntary act. In vol. xv. (1857) two singing mice are described, and another in vol. xxiii. (1865), and in this case the editor, E. Newman, in a note, says he believes it "to be the effect of some lung disease, perhaps *tubercular phthisis*,"—which, in short, is consumption. The Rev. J. G. Wood in "Illustrated Natural History" (1865), makes reference to "singing mice," but leaves the reader to come to his own conclusions on the subject—whether voluntary or caused by disease; but he, nevertheless, quotes from a long letter by the Rev. R. L. Bampfield, Essex, who believes the cause to be voluntary. In the first volume of "The Science Monthly Illustrated," for the recent year (1884), there are references to musical mice, one being by W. B. Kesteven, M.D., in which he says, "I interpreted this musical performance as being the expression of intense gratification, comparable with the pleased purring of a cat." Another reference in the same magazine is by W. T. Green, F.Z.S., who took a small musical mouse that died by the next morning and when dissected was seen to be suffering from pleuro-pneumonia. In Paisley, here, other six musical mice, in addition to the one described, have been brought under my notice. One of these which attracted attention by its cry in a room was to be taken, when it got on the window blinds, and its cry was so increased in its excitement that its pursuer in awe left it. Another of these was tied by a string round its neck to a gas pipe on the mantelpiece, where it lived and was fed for some time, keeping up its music, till, at last, it fell over the edge of the mantelpiece and was hanged.

TAYLOR, *Sub-Curator*, *Museum*, *Paisley*.

THE COLOUR OF THE RED SEA.

By Dr. Stonham.

On a recent voyage to the East, our route lay through the Red Sea, the water of which is usually of a bright sky-blue colour; but sometimes we came to long streaks of a red-brown colour, often two or three miles long, but of no great breadth—not more than two or three hundred yards. These streaks presented an irregular but well-defined border, so that a glance was sufficient to show the exact line where the red left off, and the ordinary blue began. This same appearance was also observable in the Gulf of Aden. I only saw it in calm weather, but it is rare that the water is very rough in the Red Sea, and I am unable to say whether it is to be seen in rough weather or not.

The favourite theory with the sailors concerning this colouring was, that it was due to spawn, but of what fish they did not seem very certain; others again thought that animalcula caused it.

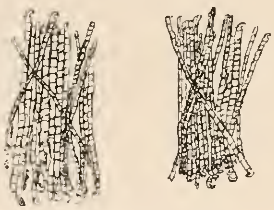


Fig. 45.—Confervæ in bundles. × 40.

On drawing up some of the water in a bucket, I found a reddish scum floating on the top, but mixed with this, and also distributed through the body of the water, numberless little objects just visible to the naked eye, and looking like little pieces of cotton finely cut up. These were colourless, if seen singly, but, seen in the mass, gave a light brown colour. The colour to the sea was given almost entirely by the reddish scum. After some of the water had been kept standing for twenty-four hours, nearly all these little bodies had disappeared, but the scum was greatly increased in quantity, being, in fact, formed by the degeneration and breaking up of these.

Under the microscope, they were found to consist of bundles of long, jointed, cylindrical bodies, quite colourless, and made up of from fifteen to twenty segments, each segment being nearly square and apparently structureless. The last segment differed from the others in shape forming a hook. Thirty to forty of these cylindrical bodies were aggregated to form each bundle, and it was rare to find one detached from the bundle. The hooked ends were not arranged all at one end in the bundle, but some at one end, some at the other. On examining some of the water, that had been kept, I found the bundles very indistinct, the structural character was obliterated and a granular matter of a pale yellow colour had taken its place. Some of the cylindrical bodies could be observed in process of undergoing the change; the segments at one end would be visible, while, at the other, they were indistinct and filled with granular material.

The red appearance of the sea was due to the bodies breaking up into this granular material; previous to this they gave no colour observable more than a few yards off, and for that distance only a slight light brown appearance mixed with the blue.

I find that Darwin in his "Voyage of a Naturalist," mentions that he came across red bands of this kind near the Abrohlos Islets off the coast of South America, and says that they are due to Confervæ of the species *Trichodesmium erythræum*, and that they are also found in the sea near Australia. It appears, therefore, that they are by no means peculiar

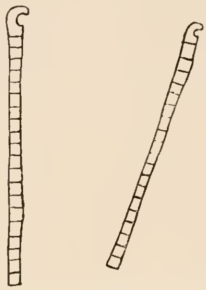


Fig. 46.—Single confervæ, when separated from a bundle. × 100.

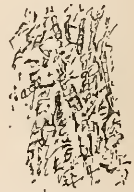


Fig. 47.—Confervæ bundle breaking down into granular material.

to the Red Sea, and can bear a lower temperature than they experience in those hot waters. Their distribution in the water in bands of great length and little breadth, their well-defined margins, and how and when they take their origin, are facts which I cannot explain, and concerning which I shall be glad to gain information.

THE VALE OF LLANGOLLEN: A PERSONAL VISIT.

Having read with great interest the glowing paper written by the Editor of Science-Gossip in last July number, of his visit to Llangollen, my sister and I determined to visit it ourselves. We owe Dr. Taylor thanks for our stay at one of the sweetest spots we ever stayed at. Armed with the number of Science-Gossip containing his paper, we went to Llangollen in the middle of September, and visited nearly every locality he names for fossils, and our searches were crowned with success. Hafod is a wonderful spot. We believe we saw there some of the identical huge corals which Dr. Taylor describes as being beyond his strength to remove, and there they still remain for other admiring eyes to rest upon. My

sister and I brought away some exquisite specimens from Hafod, also from the Eglwyseg rocks, &c. At the "World's End" we found very fine Productus. In a quarry near the canal, guided there by Mr. W. B. Hardy, we found most interesting upper Silurian bivalves among the slates; but, although we searched diligently, we could only find small pieces of trilobites. Barber's Hill, and all the other lovely mountains were clothed in the richest and most brilliant autumnal tints, and as we had some showery days, rainbows seem to reflect themselves on every mountain-top. The river Dee tumbled and foamed, and sounded as merrily in its autumn tones to us as in its summer voices to Dr. Taylor. Wild flowers and ferns gladdened our eyes everywhere, our only difficulty being the Welsh tongue. Often in our ten or twelve or fourteen mile walks we needed guidance, but had to follow signs—the country folks could not understand us, nor we them; the louder they shouted, the more we laughed.

Of course, we put up at the Royal Hotel, and found the host and hostess most attentive. No one should visit Llangollen without going to the Royal Hotel.

For several weeks we remained in North Wales, seeing many beautiful spots. Barmouth, with its exquisite Panorama Walk; Glandovey, with its far-famed valley; Dolgelly with its splendid mountains, the old Cader Idris towering above them all; Aberystwith, with the wonderful Falls at the Devil's Bridge, &c. But we returned home by Llangollen again, and concluded no spot could be fairer than this little paradise, so truly and beautifully described by our Editor last summer.

FANNY M. HELE.

Bristol.

DWARF ELDER OR DANE'S-BLOOD.

IN the January part of the P. M. S. Journal, at p. 12, it is stated, regarding the *Anemone pulsatilla*, pasque anemone or pasque flower, so called because it flowers about Easter time; that "there is a legend that this flower only grows where Danish blood was spilt. From such names as 'Woeful Dane's Bottom,' one might certainly conclude that fierce battles may have been fought with the Danes in the neighbourhood of Minchinhampton." And the writer of the article then gives two original verses, embodying this statement which is quite new to me. I have always heard the legend told about another plant, the dwarf elder (*Sambucus ebulus*) which is called in Smith's English Flora, Hooker's Flora, and Bentham's Flora, "Danewort."

In the first of these works is this passage in explanation of the name,—"Our ancestors evinced a just hatred of their brutal enemies the Danes, in supposing the nauseous fetid and noxious plant before us to have sprung from their blood." And in a modern book, entitled "Flower Lore," pp. 233, the writer, whose name does not appear, says: "The dwarf elder is said only to grow where blood has been shed either in battle or in murder. A patch of it grows on ground in Worcestershire, where the first blood was drawn in the Civil War between the Royalists and the Parliament. The Welsh call it *Llysan gwaed gwyr*, or plant of the bloody man;" a name of similar import is its English one of *deathwort*. It is chiefly in connection with the history of the Danes in England that the superstition holds, wherever the Danes fought and bled there did the dwarf elder, or Dane's blood spring up and flourish. It is a well-known fact that if ground be deeply stirred or cleared by fire, plants grow up often of a species previously unknown to the district. The Bartlow Hills in Cambridgeshire were raised in memory of the Danes who fell in the battles fought in 1016, between Cnut and Edmund Ironsides. It is probable that the danewort may have been there observed for the first time; and what so natural as to connect the new-found plant with the blood of the fallen Danes?"

The dwarf elder is not a common plant, but wherever found it is mostly abundant. I have never heard any legend about it in Ireland. Among several of its localities with which I am acquainted in Ulster, by a strange coincidence, there are two which quite corroborate "the legend of its bloody origin," one is the earthen fort of Rathmore, near the town of Antrim, where, according to Bede's Hist. Eccl., as cited by Keating, Egfrid, king of the Northumbrians, fought a battle with the Picts in A.D. 684; and the other is Moira the modernised form of pronouncing Magheath, where one of the most momentous battles ever fought in Ireland occurred A.D. 637, between the exiled Congal Cloan and Donald, king of Ireland, resulting in the defeat of the rebels and invaders.

H. W. LETT, M.A.

NIDIFICATION IN STAFFORDSHIRE.

I HAD the pleasure of finding, at Sandon, on June 9, 1879, the nest of the pied fly-catcher (*Muscicapa atricapilla*); it contained six eggs, partly incubated. The nest, composed of dried grasses, moss, roots, and feathers, was placed against the gnarled side of a pollard oak, underneath an overhanging branch.

The hawfinch (*Coccothraustes vulgaris*) I usually find nesting at Sandon; a friend has found it at Eccleshall; and at Swynnerton, where it was formerly scarcely ever seen, it is now becoming comparatively common; the gardener there tells me it is very troublesome, being very fond of peas. In the season it destroys more of them than any other bird.

The nightingale (*Daulias luscinia*) is coming nearer to the north of the county; in the summer of 1883, many were delighted by listening to the sweet song at Sandon. Unfortunately one night it was frightened by some dogs, and deserted the place, at least it was not heard again.

It has been heard in Brandesert Park, Rugeley, for some years past. On May 13, 1880, I found also at Sandon, the nest of the Zwete or Mountain Linnet (*Linola flavirostris*), it was built at the extremity of the bough of a holly-tree, just on the ground; this is much further south than the usual nesting range of this interesting bird.

The Great Crested Grebe (*Podiceps cristatus*) nests with us yearly at Copmere. In June last, a friend and I observed the male bird covering the eggs before leaving the nest, showing that he was sharing the labours of incubation. I have often observed the nest of this species, and have always found the decaying weeds of which they were composed to be very hot; no doubt this arises from their decomposition, and it materially assists to hatch the eggs.

THE MOSSES AND HEPATICÆ OF THE FOREST OF DEAN.

IN March of last year, a small party of kindred spirits addicted to confirmed habits of grubbing about under hedges and in ditches and bogs, for mosses and such-like unconsidered trifles, visited the Forest of Dean with the object of ascertaining how many species of the classes *Musci* and *Hepaticæ* could be obtained during a day's walk in this paradise for the cryptogamic botanist. The day proving all that could be desired, in the absence of drying winds or hot sunshine, such drawbacks to the successful observation of these frail cellular plants, the list may be considered a fairly representative one; and the following record of the species observed during the walk shows that this locality teems with good things, though having previously decided to record everything met with in these classes, some of the included species are common almost everywhere. The starting point in the morning was the Newnham Railway Station, and the route fixed upon lay by the way of Pleasant Stile, through the valley running from Little Dean to Soudley Furnace, past the Abbott's Wood, thence through the Soudley Valley to Blakeney, in time to catch a homeward train in the evening from the Severn Bridge Station, after a most enjoyable day. The distance traversed would be about ten miles; though collecting was practically over after eight miles, on account of the growing dusk.

The mosses were as follows:— *Rhynchostegium ruscifolium*, *R. tenellum*, *R. confertum*, *Brachythecium glareosum*, *B. albicans*, *B. rutabulum*, *B. populeum*, *Eurhynchium striatum*, *E. prælongum*, *Plagiothecium denticulatum*, *Amblystegium serpens*, *Hypnum filicinum*, *H. cupressiforme* (two or three forms), *H. patientiæ*, *H. molluscum*, *H. chrysophyllum*, *H. stellatum*, *H. cuspidatum*, *H. Schreberi*, *H. purum*, *Hylocomium splendens*, *H. squarrosum*, *H. triquetrum*, *Camptothecium lutescens*, *Homalothecium sericeum*, *Thuidium tamariscinum*, *Fissidens bryoides*, *F. adiantoides*, *F. taxifolius*, *Neckera complanata*, *Homalia trichomanoides*, *Pogonatum nanum*, *P. aloides*, *P. urnigerum*, *Atrichum undulatum*, *Polytrichum piliferum*, *P. juniperinum*, *P. commune*, *Aulacomnium palustre*, *Mnium undulatum*, *M. hornum*, *M. rostratum*, *Bryum bimum*, *B. pallescens*, *B. cæspiticium*, *B. argenteum*, *B. capillare*, *Webera carnea*, *Physcomitrium pyriforme*, *Philonotis fontana*, *Funaria hygrometrica*, *Orthotrichum saxatile*, *O. Lyellii*, *Ulota crispa*, *Rhacomitrium canescens*, *R. lanuginosum*, *Grimmia apocarpa*, *G. pulvinata*, *Eucalypta vulgaris*, *E. streptocarpa*, *Ceratodon purpureus*, *Tortula ruralis*, *T. unguiculata*, *T. fallax*, *T. convoluta*, *T. muralis*, *T. subulata*, *Didymodon rubellus*, *Anacalypta lanceolata*, *Pleuridium subulatum*, *Dicranella heteromalla*, *D. varia*, *Dicranum scoparium*, *Weissia cirrhata*, *Sphagnum molluscum*.

The *Hepaticæ* met with were these:—*Jungermania gracillima*, *J. crenulata*, *Diplophyllum albicans*, *Plagiochila asplenioides*, *Porella platyphylla*, *Cephalozia divaricata*, *C. bicuspidata*, *Lophocolea heterophylla*, *Chiloscyphus polyanthos*, *Kantia Trichomanis*, *Nardia scalaris*, *Frullania dilatata*, *Aneura multifida*, *Metzgeria furcata*, *Marchantia polymorpha*, *Conocephalus conicus*, *Anthoceros lævis*.

The nomenclature of the London Catalogue has been followed in this list, which must not be by any means considered exhaustive of this interesting and delightful locality, as the route lay over only a small portion of the outskirts of the forest. It is hoped at some other time to supplement this by a further list to include other species to be hunted up during future visits, and already met with in past visits, but not falling under notice in this present one.

G. HOLMES and E. J. ELLIOTT.

Stroud, Gloucester.

GEOLOGICAL DISCOVERY, 1884.*

THE TWO VIEWS.

The Official View.

OH! where do patent-rights exist
Outside of governmental camp?
Or why with loud complaints persist
When we put the official stamp—
The survey stamp—on what is done
By others, by their labour won?

What gold, we ask, would circulate
Until impressed within our mint?

* See papers by Dr. Geikie in "Nature" on Highland Geology, and letters by Dr. Callaway in "Daily News," &c.

Go, cease your howling—can we state
In larger or in clearer print,
"That when the survey sheets appear,
Your work will stand out bright and clear."

The Unofficial View.

That then it will shine bright and clear,
We venture to express a doubt;
And pardon us if we do fear
The work you'll linger long about.
At all events, we fain would try
To get some praise before we die.

Meanwhile 'tis you too greedy eat
The modest amateurs' food;
Come, let us fairly share the meat,
'Tis on our banquet you intrude.
Big dogs! you'd take our only bone.
Ah! where have truth and justice flown?

A. CONIFER.

HUMBLE-BEES ON THE PAMPAS.

By W. H. HUDSON.

TWO humble-bees, *Bombus thoracicus* and *B. violaceus*, are found on the pampas: the first, with a primrose yellow thorax, and the extremity of the abdomen bright rufous, slightly resembles the English *B. terrestris;* the rarer species, which is a trifle smaller than the first, is of a uniform intense black, the body having the appearance of velvet, the wings being of a deep violaceous blue.

A census of the humble-bees in any garden or field always shows that the yellow bees outnumber the black in the proportion of about seven to one; and I have also found their nests for many years in the same proportion;—about seven nests of the yellow to one nest of the black species. In habits they are almost identical, and when two species so closely allied are found inhabiting the same locality, it is only reasonable to infer that one possesses some advantage over the other, and that the least favoured species will eventually disappear. In this case, where one so greatly outnumbers the other, it might be thought that the rarer species is dying out, or that, on the contrary, it is a new-comer destined to supplant the older more numerous species. Yet, during the twenty years I have observed them, there has occurred no change in their relative positions; though both have greatly increased in numbers during that time, owing to the spread of cultivation. And yet it would scarcely be too much to expect some marked change in a period so-long as that, even through the slow-working agency of natural selection; for it is not as if there had been an exact balance of power between them. In the same period of time I have seen several species, once common, almost or quite disappear, while others, very low down as to numbers, have been exalted to the first rank. In insect life especially, these changes have been numerous, rapid, and widespread.

In the district where, as a boy, I chased and caught tinamous, and also chased ostriches, but failed to catch them, the continued presence of our two humble-bees, sucking the same flowers and making their nests in the same situations, has remained a puzzle to my mind.

The site of the nest is usually a slight depression in the soil in the shelter of a cardoon bush. The bees deepen the hollow by burrowing in the earth; and when the spring foliage sheltering it withers up, they construct a dome-shape covering of small sticks, thorns, and leaves bitten into extremely minute pieces. They sometimes take possession of a small hole or cavity in the ground, and save themselves the labour of excavation.

Their architecture closely resembles that of *B. terrestris.* They make rudely-shaped oval honey-cells, varying from half an inch to an inch and a half in length, the smaller ones being the first made: later in the season the old cocoons are utilised for storing honey. The wax is chocolate-coloured, and almost the only difference I can find in the economy of the two species is that the black bee uses a large quantity of wax in plastering the interior of its nest. The egg-cell of the yellow bee always contains from twelve to sixteen eggs. At the entrance on the edge of the mound one bee is usually stationed, and, when approached, it hums a shrill challenge, and then throws itself into a menacing attitude. The sting is exceedingly painful.

One summer I was so fortunate as to discover two nests of the two kinds within twelve yards of each other, and I resolved to watch them very carefully, in order to see whether the two species ever came into collision, as sometimes happens with ants of different species living close together. Several times I saw a yellow bee leave its own nest and hover round or settle on the neighbouring one, upon which the sentinel black bee would attack and drive it off. One day, while watching, I was delighted to see a yellow bee actually enter its neighbour's nest, the sentinel being off duty. In about five minutes' time it came out again and flew away unmolested. I concluded from this that humble-bees, like their conquerors of the hive, occasionally plunder each other's sweets. On another occasion I found a black bee dead at the entrance of the yellow bees' nest; doubtless this bee had been caught in the act of stealing honey, and, after it had been stung to death, it had been dragged out and left there as a warning to others with like felonious intentions.

There is one striking difference between the two species. The yellow bee is inodorous; the black bee when angry and attacking emits an exceedingly powerful odour; curiously enough, this smell is identical

in character with the smell made when angry by the wasps of the S. American genus Pepris—dark blue wasps with red wings. This odour at first produces a stinging sensation on the nerve of smell, but when inhaled in large measure becomes very nauseating. On one occasion, while I was opening a nest, several of the bees buzzing round my head and thrusting their stings through the veil I wore for protection, gave out so pungent a smell that I was compelled to retreat.

It seems strange that a species armed with a venomous sting and possessing the fierce courage of the humble-bee should also have this repulsive odour for a protection. It is, in fact, as incongruous as it would be were our soldiers provided with guns and swords first, and after that with phials of assafœtida to be uncorked in the face of an enemy.

Why, or how, animals came to be possessed of the power of emitting pestiferous odours is a mystery; we only see that natural selection has, in some instances, taken advantage of it to furnish some of the weaker, more unprotected species with a means of escape from their enemies. The most striking example I know is that of a large hairy caterpillar I have found on dry wood in Patagonia, and which, when touched, emits an intensely nauseous effluvium. Happily it is very volatile, but while it lasts it is even more detestable than that of the skunk.

The skunk itself offers perhaps the one instance amongst the higher vertebrates of an animal in which all the original instincts of self-preservation have died out, giving place to this lower kind of protection. All the other members of the family it belongs to are cunning, swift of foot, and, when overtaken, fierce-tempered and well able to defend themselves with their teeth.

For some occult reason they are provided with a gland charged with a malodorous secretion. The skunk alone when attacked makes no attempt to escape or to defend itself by biting; but thrown by its agitation into a violent convulsion discharges its fœtid liquor into the face of its opponent. When this animal had once ceased to use so good a weapon as its teeth in defending itself, degenerating at the same time into a slow-moving creature, without fear and without cunning, the strength and vileness of its odour would be continually increased by the cumulative process of natural selection: and how effective the protection has become is shown by the abundance of the species throughout the whole American continent. It is lucky for mankind—especially for naturalists and sportsmen—that other species have not been improved in the same direction.

But what can we say of the common deer of the pampas (*Cervus campestris*), the male of which gives out an effluvium, quite as far-reaching if not so abominable in character as that of the Mephitis? It comes in disagreeable whiffs to the human nostril when the perfumer of the wilderness is not even in sight. Yet it is not a protection; on the contrary, it is the reverse, and, like the dazzling white plumage so attractive to birds of prey, a direct disadvantage, informing all enemies for leagues around of its whereabouts. It is not, therefore, strange that wherever pumas are found, deer are never very abundant; the only wonder is that, like the ancient horse of America, they have not become extinct.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S.

I HAVE just turned up an account of the Superga Railway in the "Journal of the Society of Arts," of September 12th last. Carriages are there run on the system invented by Tommaso Aguido, and they climb an incline of 1 in 51 by means of an endless rope connected with a stationary engine; the rope, however, does not pull up the carriages, but merely communicates motion to the driving carriage of the train, thereby saving the weight of locomotive and tender, and demanding a much tighter rope than would do the haulage. This system having been practically tested on a small scale with a gradient of 1 in 2·53, the Italian Government gave a subsidy of £36,000, and the city of Turin a further subsidy of £12,000, together with special concession to a company for making the line. This is how such projects for the practical application of science are generally encouraged on the continent, but what occurs here? A company is formed to carry out a project that shall benefit the nation at large—such for example as the Manchester Canal, and immediately all the obstructive parliamentary machinery of both houses is hired by vested interests for the purpose of suppressing it. Some years ago I travelled from Flintshire to Westminster in order to give evidence to a parliamentary committee in favour of the Wrexham, Mold, and Connah's Quay Railway, which, besides opening out a rich mineral district, would have shortened the route between London and Holyhead by some miles when extended to Ellesmere, &c. But, just in proportion to such usefulness, would it compete with the vested interests of the Great Western and North-Western Railways, and therefore they combined to crush it. On presenting myself at the committee room with others, we were informed by the counsel for the small line that the chairman of the committee was a Great Western man, the rest were either ditto or North-Western, and therefore the case was prejudged and no evidence could be of any use. We all returned to Wales accordingly, and gave no evidence. Finally only a bit of the line was graciously permitted by the big companies to be constructed, that bit which could not compete with their monopoly. The parliamentary expenses of this far exceeded those of construction, and the trains carried a sheriff's officer "in possession."

Still, we Englishmen express our pharisaical horror of the commercial corruption of New York. We thank God that we are not as those wicked people are, and grumble about commercial depression.

The season is now approaching for testing the question of whether or not the tomato possesses the property attributed to it by some of the Cape colonists; that of driving away insects from the land on which it is grown. Its cultivation under fruit trees is accordingly recommended. It may possibly be thus efficacious at the Cape, but not so here. Our greenhouses afford better opportunities of settling the question than any open air plantations can supply; nothing being easier than to carry a few pots of growing tomatoes into an insect-pestered house, leaving open doors and windows and noting the result. If this were done skilfully, we should also learn whether insects generally, or only particular species, manifest the alleged aversion to this plant.

Patagonian geology is not profoundly studied in this country, but is very interesting nevertheless, as shown by the results of the explorations of Señor F. P. Moreno, communicated to the Argentine Scientific Society. Palæontological evidence indicates that Patagonia is not, as usually supposed, of marine origin, but that much of it is terrestrial and lacustrine. Señor Moreno concludes that at the beginning of the Tertiary period a vast continent, of which Patagonia was a part, extended east and west. Oscillation is still proceeding in the southern part of the continent, and the depth of the sea around is so small that an elevation of 150 metres would unite Patagonia with Tierra del Fuego and the Falkland Islands, forming a continent there as wide as Africa at the Orange River. Less than 2000 metres of elevation would further unite all this with South Georgia, South Sandwich Land, and the Antarctic Continent.

I doubt whether the conclusions based merely on this shallowness are sound, I mean those suggesting the former existence of such a continent. The sea all thereabouts must be subject to continual shallowing by the deposits from the icebergs which there abound, and are continually thawing. Señor Moreno describes the visible moraines that form the labyrinth of islets in the Straits of Magellan and their neighbourhood; but besides these, there must be a vast "moraine profonde" ever growing upwards from the sea bottom.

One of the results of the introduction of gelatine dry plate photography, is the supplying of accurate pictures of the heavens. The fixed stars, so called, can thus be easily and accurately represented, both in position and magnitude, and by putting together the different pictures of limited areas thus obtained a complete self-drawn chart of the heavens is obtainable. Mr. A. A. Common recently exhibited at the Royal Astronomical Society pictures of a part of the constellation Orion, and of the Pleiades, in which stars of the ninth and tenth magnitudes were shown. Such pictures supplementing, correcting, and confirming the star catalogues made in the usual way, supply data upon which may be founded the solution of that great problem of "star drift," representing the greater movements of the universe, compared with which those of our own world in its orbit, or even the wanderings of our sun in space, are but minor creepings. By the spectroscopic method of Dr. Huggins we learn the approach and recession of stars in the line of sight; by the photographic pictures we may be shown their movements across that line; by combining these, the actual direction of travelling. Shall we thus ever learn the position of the universal centre around which all the suns and all their attendant worlds are moving?

The barrenness of the Pampas is explained by Mr. Arthur Nicols in an interesting letter to "Nature" of January 29th last. He tells his experience, in the Pampas of La Plata, of the ravages of the omnipresent leaf-eating ant, which clears away the first leaves of any tree that may be planted either naturally or artificially. The animals prove their prowess by shearing off the hard cuticle of the thumbs and fingers of those who pick them up. Nevertheless it is possible to overcome them. Mr. Nicols describes a splendid grove of Eucalypti of several species that were reared from seed by first painting a circle of gas tar around each. The disappearance of the first leaves was thus prevented, as the ants objected to cross the tar, and then by painting the stems with tar during the first three years the trees made such a start as to grow faster than they could be destroyed. Many of these trees were forty feet high, and measured three feet round at three feet above the ground when eight years old. By lighting fires over the nests of the ants during the winter, when the colony is all at home, these pests may be destroyed. From Mr. Nicols' account it appears that their assimilation and distribution of vegetable matter has richly manured the surface, and thus prepared it for the use of men who are sufficiently intelligent and energetic to avail themselves of the services of these ants, and regulate their destructiveness.

The subject of earth tremors is a very interesting one. There are good reasons for supposing that the so-called "solid" crust of the earth is uplifted in tidal waves, is agitated by big waves, by wavelets and ripples as the ocean is, but accurate observation of these is difficult, one of the chief obstacles being the confusion of artificial with natural vibrations. As everybody knows, the passing of a wagon along an ordinary street, produces earth-waves that can be felt as we sit on our chairs, or lie in bed. These of course are but local and very limited, but beyond these are far reaching natural waves demanding systematic study. Much has already been done in Japan, which is a stormy earth-region continually agitated by earthquakes, great or little. We reside on a less stormy crust, but one that is by no means absolutely calm.

The Government grant committee has wisely supplied Professor Ewing, of Dundee, with £100 for the purpose of instituting observations of earth movements on Ben Nevis. The isolated position of this mountain, distance from railways, factories, or other artificial disturbers, renders it suitable for such observations, which are to be added to the work of the observatory already established there.

According to a communication to the French Academy of Sciences (December 29) from M. Sacc, there is cultivated in Bolivia a cotton-tree which yields abundantly a seed which is richer than any of the known grains in nitrogenous food. M. Sacc is convinced that the flour from this seed is destined to take an important place in human food supply, especially in the preparation of all kinds of pastes, as it contains so much vegetable oil as to render the addition of milk and animal fats unnecessary. The vegetarians should look after this and obtain samples. Their chief difficulty hitherto has been in finding a supply of fatty matter sufficient to meet the food demands of our climate, without being dependent on animal products. Most of them would like to be independent of the dairy; the leguminous plants enable them to be so as regards casein, but still their puddings and pastry generally appeal for butter. A seed containing both flour and butter in pastry-cook proportions is exactly what they now want.

Carbon disulphide is growing in importance. I remember buying it at two shillings an ounce in order to make a solution of phosphorus for the precipitation of metallic silver on plaster of Paris casts when the electrotype was a new art. Now it is retailed at sixpence per pound. This difference arises simply from the increased demand which has usually such a cheapening effect upon chemical products. At the time I refer to the best obtainable was most foul in odour, and even now, the ordinary commercial samples are very suggestive of essence of sewage. Ckandi-Bey ("Comptes Rendus," vol. 99, p. 509) tells us that alone and in aqueous solution it arrests all fermentations, kills microbes, and is one of the most energetic of antiseptics. Dr. Dujardin Baumetz administers its aqueous solution as a medicine in cases of typhus. He says that it arrests diarrhœa and disinfects the breath and excretions of the patients. This is curious in connection with its own foulness, even though that foulness be due to impurities. It certainly does not obey the injunction, "Physician heal thyself."

SINGING MICE.—There are several notices of singing mice in SCIENCE-GOSSIP, as follows: p. 274, 1871; pp. 47, 65, and 94, 1872; and p. 187, 1873. As regards the true explanation, that seems to be a difficult task, for I find there are some who attribute it to disease, whilst others consider it a natural peculiarity, and even intelligence.—*A. G. Rudd, Lufton.*

BRITISH PLANTS IN NYMAN'S CONSPECTUS FLORÆ EUROPÆÆ.

By ALFRED R. WALLER.

II.

MŒNCHIA QUATERNELLA, Ehrh., 1788, rightly replaces *M. erecta*, Fl. Wett., 1800. *Stellaria umbrosa*, Op., is placed as a sub-species of *S. media*, Cyr., with *S. Boreana*, Jord., as a variety. *S. palustris*, Ehrh., 1795, takes the place of *S. glauca*, With., 1796, and *Sagina Linnæi*, Pr., 1835, that of *S. saxatilis*, Wimm., 1840. *Spergularia media*, Pers., and *S. salina*, Presl, are thought to be species. The form of *Linum perenne*, L., we get is *L. anglicum*, Mill. (Spr.), which out of England is found only in West Germany and France (?). *Tilia platyphyllos*, Scp., 1772, rightly replaces *T. grandifolia*, Ehrh., 1790, as the name of the large-leaved lime. *Medicago denticulata*, W., is thought to be a sub-species of *M. lappacea*, Desv., while *M. apiculata*, W., is raised to specific rank. Scotland might be added to the list of countries for *Trigonella ornithopodioides*. The following are changes in the right direction:—*Melilotus officinalis*, Desv., 1797, instead of *M. arvensis*, Wallr., 1822; *M. altissima*, Th., 1799, instead of *M. officinalis*, W., 1809; *Lotus uliginosus*, Schk., instead of *L. major*, Sm.; *Astragalus danicus*, Retz, instead of *A. hypoglottis*, L. *Stellaria media*, *Spergula arvensis*, *Sagina procumbens*, *Trifolium repens*, and *Geranium Robertianum*, are found in every country in Europe. *Geranium nodosum*, L., and *Oxalis stricta*, L., are erroneously given as natives.

TEETH OF FLIES.

THE DUNG-FLY (*SCATOPHAGA STERCORARIA*).

By W. H. HARRIS.

No. IV.

I HAVE selected for illustration on this occasion a very interesting and robust form taken from the common dung-fly (*Scatophaga stercoraria*), whose winged eggs are always objects of interest, providing, as they do, in a very remarkable manner, for the welfare of the species. It is necessary for the development of the larvæ that the eggs should be deposited in soft dung, at the same time they must not be immersed entirely. To guard against such a misfortune the eggs are provided with two lateral expansions, or wings as they have been termed, which effectually prevents them sinking by their own weight in the soft dung in which (during the summer months) any quantity may be procured.

The teeth presented to us in this creature are of three distinct forms. Taking the blow-fly as the

original type form (and it is quite worthy of the distinction), it will be found the two marginal ones retain the shape and general appearance of our type; those situated next depart in some degree therefrom; one portion or dentule, if I may use the term, is much more developed, being both longer and broader; of the two central teeth one may be said to be a still further development of those last referred to, but the large dentule stands out conspicuously robust, whereas the smaller one has not been correspondingly enlarged; the remaining tooth appears at first sight a simple enlargement of the blow-fly type, but it will be seen the difference occurs in the shape of the inner edges of the dentules. In the original form these edges are quite straight, whereas in the present object they are decidedly curved. Each lobe of the proboscis is provided with six teeth, and the whole of these teeth still further depart from the blow-fly type in being very considerably thickened throughout their entire width instead of at the margins only.

Fig. 48.—Teeth of Dung-fly (*Scatophaga stercoraria*). Enlarged 200 diams.

It is well known to those who have been close observers of the diptera that the Scatophagidæ are occasionally carnivorous in their habits, they have been frequently seen to seize, crush and extract, the juices of smaller flies, and appear to be rather expert in doing so; the dentition is very powerful for a creature of its size, and as the two series of teeth can be approximated, it can be readily conceived how the execution is effected.

All the Scatophagidæ are in the acalypterate division of the muscidæ, and so far as my investigation of their dentition has gone, there appears to be greater uniformity in number of teeth, form, and arrangement, than is met with in other divisions of this order of insects.

During the coming season I should be glad to receive from any person freshly killed specimens of Diptera, correctly named, with the view of carrying these observations still further. Specimens so intended, should be placed in a small quantity of dilute glycerine and sent to my address, 44 Partridge Road, Cardiff. Any specimens having distinctive features shall, with the editor's kind permission, be made known through the pages of SCIENCE-GOSSIP.

STUDIES OF COMMON PLANTS.

No. I.—THE CUCKOO-PINT. (*Arum maculatum.*)

By CHARLES F. W. T. WILLIAMS, B.A. Cantab.

THERE are, perhaps, few plants better known than *Arum maculatum.* There are many reasons for this. It is very common, and is found growing almost in every spot where there is sufficient earth to nourish it. Then again its leaves are amongst the earliest to present themselves before the delighted eye of the observant rambler; and, as he gazes on them, he knows that spring, with all its varied forms of infant life, is not far distant. Lastly, there is a recollection of sunny summer days in the distant past, when as happy children, we roamed

through wood and meadow, plucking with all eager expectancy the spadix of this plant. Thus, as far as outward form is concerned, it has been known to most from very early years.

My object in this paper is not however to examine into the lore of the plant, or to discuss its various common names, but to look somewhat closely into its

Fig. 49.—Young plant of *Arum maculatum*. *a*, roots; *b*, living corm; *c*, old corm.

construction and economy, considered botanically and microscopically. I venture to think that by the time we have finished our investigation, it will be found that *Arum maculatum* possesses points of interest well worthy the attention of all careful observers.

The natural order Aroideæ, to which the Arum belongs, does not furnish many plants to the flora of this island. Examining, first, the underground portion of the plant, we find a corm producing leaf-buds at

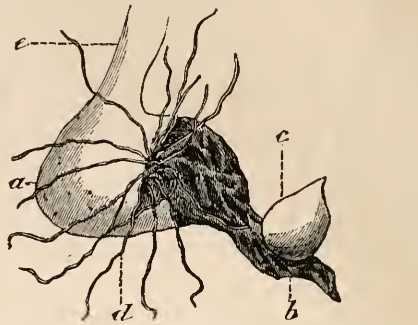


Fig. 50.—Corms of *Arum maculatum*. *a*, this year's corm; *b*, old corm; *c*, young corm; *d*, roots; *e*, petiole.

Fig. 51.—Starch grains from corm of *Arum maculatum*.

Fig. 52.—Transverse section through corm cells and thick starch masses.

one point and roots at another. (Fig. 49.) It frequently happens that a specimen is met with in which three distinct periods of life and growth may be observed. Such is the case in Fig. 50. The corm of the arum is of great interest when examined with care. If a corm be cut across, a white deposit will

be left on the blade of the knife, and also on the fingers, if they come in contact with the section. On microscopical examinations of a transverse section the whole field will be found to be full of a dense mass of bodies which are starch grains. Such a quantity of starch is stored up in the cells that it is difficult to obtain a section giving any clear view of the cell structure. Fig. 51 represents some of the starch grains highly magnified. Fig. 52 is an attempt to show the cells of the corm in some cases empty, and in others densely crowded with starch grains, so densely, in fact, as to become all but black. A ¼ is the lowest power with which to observe these points. At the present time the corm of the arum is not, so far as I am aware, in any great request, either medicinally or otherwise. Dr. Taylor mentions that the starch has been "misused" in order to adulterate arrowroot.* In order, however, to learn some of the

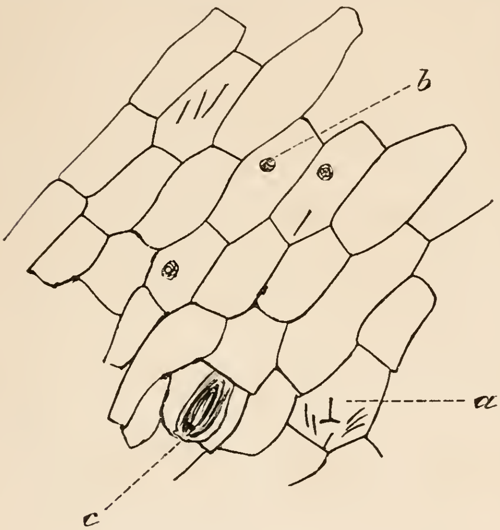


Fig. 53.—Cells of the epidermis of petiole. *a*, raphides; *b*, nucleus; *c*, stoma.

valuable, not to say wonderful, properties of this portion of *A. maculatum*, and some of the uses to which it has been applied, it is necessary to go back a little for information.

In a certain dictionary published in London in the year 1832, and known as "The Universal Herbal or Botanical, Medical and Agricultural Dictionary," by Thomas Green, 2 vols. we learn much. Mr. Green first informs his readers that if they have been rash enough to taste the "root," an antidote will be found either in milk butter, or oil. Writing still of the "roots" he goes on to say: "When dried they become farinaceous and insipid, in which case they might be used for food in case of necessity; and by boiling or baking would probably afford a mild and wholesome nourishment as well as those sorts which are natives of hot climates. The roots when dried and powdered, are used by the French as a wash for the skin, and sell under the name of Cyprus powder, at a high price, being an excellent and innocent cosmetic. Starch may also be made from them, but the hands are liable to be blistered in using it. They have occasionally been substituted for soap. When newly dried and powdered the root has been given as a stimulant, in doses of a scruple and upwards; but

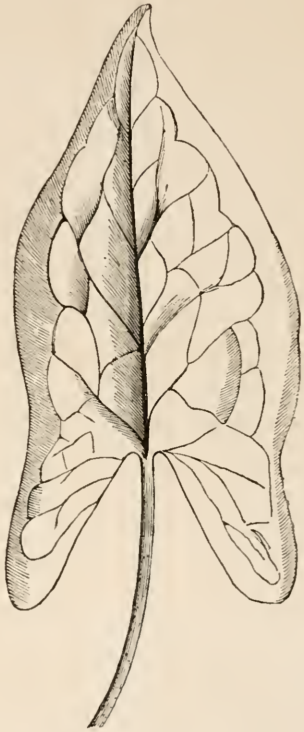


Fig. 54.—Hastate-cordate leaf of *Arum maculatum*.

in being reduced to powder it loses much of its acrimony; and there is reason to suppose that the compound powder which takes its name from the plant, owes its virtues chiefly to the other ingredients. The pulvis ari compositus, or powder composed of arum, is therefore discarded from the London dispensatory, and, instead of it, a conserve is inserted, made by beating half a pound of fresh root with a pound and a half of fine sugar.

"In the medicine recommended by Sydenham against rheumatisms, the acrid anti-scorbutic herbs are largely joined with it. Dr. Lewis orders the fresh root to be beaten with a little testaceous powder, and mixed with an equal quantity of gum arabic, and three or four times as much conserve, and thus to be made up into an electuary; or else to be rubbed with a thick mucilage of gum arabic and

* "Half-hours in the Green Lanes," p. 227.

spermaceti, adding any watery liquor and a little syrup to form an emulsion ; two parts of the root, two of gum, and one of spermaceti. In this form, he has given the fresh root from ten grains to upwards of a scruple three or four times a day. It generally occasioned a sensation of slight warmth, first about the stomach, and afterwards in the remoter parts ; it manifestly promoted perspiration, and frequently produced a plentiful sweat. Several obstinate rheumatic pains were removed by this medium, which he therefore recommends to further trial. Chewed in the mouth it has been known to restore the speech in paralytic cases, and made into a conserve it is efficacious in scurvy and rheumatism. It likewise increases the urinary secretion, and is good in the gravel. But in whatever form it is used the root should be fresh, for it loses the greater part of its efficacy in drying, and becomes insipid."

In these more enlightened days it may possibly be difficult to find persons with sufficient faith to try for themselves the truth of the above remedies. Certainly, for my own part, I should prefer, if suffering from rheumatism, a course of our own thermal waters. I need hardly say that this plant has ceased to be used in medical practice. It is no easy task to procure the corms of *A. maculatum*. Again and again failure marks the attempt to dig them up. I use a fern trowel, but frequently do not go deep enough, with the result that up come the leaf stalks, leaving the corm deep in the earth. The arum loves, too, a soil somewhat stony, and when the plant is met with in such ground, it is well to leave it alone. Anyone who tries to dig up the corm will soon discover the difficulty.

The petioles are sheathed at their base.

The structure and arrangement of the cellular and fibro-vascular tissues is fairly representative of the monocotyledons. Here again as in the corm, we find starch in the cells, though not in such large quantities. Here, too, for the first time, are to be noticed with distinction, large numbers of raphides. These occur in the corm also, but are not so easily distinguished, owing to the dense mass of starch grains. In a longitudinal section, through a petiole, we get a view of the fibro-vascular bundles, and of the cellular tissue with cells containing starch and raphides. The raphides are very minute, and a ¼ is required to see them at all well. The epidermis of the petiole consists of elongated cells with some few stomata as in Fig. 53.

The external appearance of the leaf varies. Its vernation is convolute. The most general and marked form of the leaf is hastate-cordate. (Fig. 54.) Sometimes the laminæ are spotted black, though the spots are more frequently absent. On examining one of the spots, a mass of cells filled with chromule will be observed. Other examples of a like nature will readily occur to the mind of the reader. In the epidermal cells of the lamina stomata occur, but only in very small quantities, and widely scattered. In structure, the cells of the leaf are of the ordinary type and arrangement. (*a*) The empty thick-walled cells of the epidermis. (*b*) Oblong, closely packed cells containing chlorophyll. (*c*) Loosely packed cells containing chlorophyll, and so arranged as to have air spaces. It must, I should think, strike the most casual observer that the leaves of the arum show signs of being singularly unhealthy. There are several causes for this. Even early in the season, many leaves exhibit a sickly yellow waxy appearance, very different from the healthy green of some of their relatives. On making sections it will be found that the vivid green of the chlorophyll bodies is in these changed to a golden hue and less in quantity. In several cases I have noted, in sections through the thickness of the lamina, an increase in the quantity of raphidian bundles and a surprising increase in size of the same.

(*To be continued.*)

CIVILISATION AND EYESIGHT.

A VERY important point and one which, in these times when health questions in general occupy so prominent a position, ought to engage the serious attention of school authorities, is the question of the eyesight of boys and girls, and the injury which may be done by working under bad conditions of light. The matter is not ended by seeing that a large school-room is as a whole well lighted, because the evil effects will probably be found where the pupils sit at some distance from the light, near the walls or corners of the room, reading, it may be, small print, or working by artificial light on greasy slates on which the marks are at no time very easy to see, and with here the added difficulty, that the desk at which they are working perhaps slopes so that the light makes but a small angle with the plane of the slate. There can be little doubt that this state of things, where it prevails, is one cause not only of rounded backs, and undeveloped chests, but of injured eyesight and the need for spectacles among school-boys. Surely it is bad economy to stint light. In a paper on the "Influence of Civilisation on Eyesight," by Mr. Brudenell Carter, read at a recent meeting of the Society of Arts, the author gives very interesting details as to the prevalence of defects of vision. "An enormously large proportion of the whole German nation is composed of the wearers of spectacles, and there is abundant evidence that the need for such assistance dated from a comparatively recent period." In an investigation of a London Board School, made last year by Mr. Adams Frost, it was found that rather more than one-fourth of the children had defective or subnormal vision. Mr. Carter thinks that ignorance of what the normal

powers of the eyes should be, on the part of parents, and perhaps it might be added, of some school authorities also, is accountable for such a condition of things. Whatever be the causes, he says, that there is evidence of deterioration in two special ways, viz. short-sightedness "which had come into existence within historic time, and into prevalence almost within living memory, and which now affects at least one-tenth of our population;" and the malformation of "flat-eye." He urges care on the part of parents, the testing of the eyesight of children on their admission to school, the use of larger print in school books for very young children, and the high estimation of excellence of vision in connection with athletic sports and contests. It is to be hoped that his recommendations will bear fruit and do something towards checking the evil, not only for the sake of the individuals who may otherwise suffer in the future, but for the sake of the general benefit of the race.

SCIENCE-GOSSIP.

In the "Midland Naturalist" for February, Dr. C. T. Hudson describes the very curious *Floscularia mutabilis* discovered last year by Mr. Bolton in Olton reservoir, near Birmingham.

We have received from Mr. William Wesley, No. 63 of his welcome and useful "Natural History and Scientific Book Circular."

It is with much regret we have to record the death of Dr. J. Gwyn Jeffreys, the distinguished palæontologist and conchologist. He was one of the liveliest and sprightliest of men, and died suddenly at the age of seventy-six. Only the night before he was present at the Royal Institution, listening to a lecture by his son-in-law, Professor Moseley.

We have received from Mr. J. E. Ady, an additional issue of his able papers, entitled "Deep Sea Soundings," illustrated. Mr. Ady also offers what he calls "Optional Slides" to his subscribers.

Mr. Francis Galton contributes to "Nature" an account of the development of deaf-mutism in America. It appears from the investigations of Mr. Graham Bell, which have been based upon the experience afforded by institutions devoted to the training of deaf-mutes, that, in consequence of their isolation from ordinary society, and their being thrown so largely upon association with one another, and the large proportion of consequent intermarriages which take place among them in after life, the numbers of deaf-mutes are increasing so much as to make it probable that a deaf-mute variety of the human race may be established, if means be not taken to hinder such a result by preventing the isolation that leads to it.

In the same paper, Mr. G. J. Burch describes various experiments on the nature of flame, and thinks "that the proof is fairly complete, that the luminosity of a candle or gas flame proceeds from incandescent matter in a state of extremely fine division." If this view be substantiated, it will be practically a return to the old theory of flame.

Dr. R. von Lendenfeld, who has been studying the sponges of the Australian shores for the Linnean Society of New South Wales, thinks he has succeeded in discovering the nervous system of these low animals, which has hitherto escaped observation. The nervous system consists of small miodermal, spindle-shaped cells, similar to those ectodermal elements which perform the functions of sensitive cells in jelly-fish and higher animals.

Professor Flower, in his recent anniversary address to the Anthropological Institute, expressed his opinion that the Australian aborigines were not a pure race, but descendants of a cross between an original Melanesian population, and later intruders, probably from the South of India, and of Caucasian descent.

A great advance has been made in the life history of the Lycopodiaceæ. Mr. W. T. Thiselton Dyer, F.R.S., says that Dr. Treub, the director of the Botanic Garden at Buitenzorg, in Java, has been engaged for some time on their study, and is now acquainted with the prothallia of three species of Lycopodium. Dr. Treub has given in a recent paper an exhaustive account of the prothallium of *L. cernuum*, and a brief résumé of his results is given by Mr. Dyer in "Nature" for February 5th.

J. C. G. writes to "Nature:" In Mr. Johnston's interesting account of the ascent of M. Kilimanjaro, in equatorial Africa, which appears from time to time in the "Daily Telegraph," occurs a passage which seems deserving of being rescued from the comparative oblivion of the pages of a daily newspaper. It will be found in the number of the 16th ult., and is as follows: "Other noticeable features in the scene were the tall red ant-hills, and, strange imitation, the tall red antelopes, a species of hartebeest, resembling faintly in shape the form of a giraffe with sloping hind-quarters, high shoulders, and long neck. Being a deep red-brown in colour, and standing one by one stock-still at the approach of the caravan, they deceived even the sharp eyes of my men, and again and again a hartebeest would start up at twenty yards' distance and gallop off, while I was patiently stalking an ant-hill, and crawling on my stomach through thorns and aloes, only to find the supposed antelope an irregular mass of red clay."

An account of Dr. Emanuel Witlaczil's researches on the Embryology of Aphides may be found in the "American Naturalist" for February.

THE Hemel Hempstead Natural History Society has issued its Annual Report for 1884, which, besides notes of field excursions and fungoid and insect finds, contains abstracts of lectures delivered by Dr. Collingwood on "The Floating Population of the Ocean" and by Dr. J. E. Taylor on "Mountains and Valleys."

DURING the past month lectures were delivered by Dr. J. E. Taylor before the Hitchin Natural History Society, on "Coal, and how it was formed," and before the Clevedon Natural History Society, on "Flowers and Fruit in relation to Insects and Birds," and at Alton Institute, Hampshire, on "Earthquakes and Volcanoes."

THE newly-formed Society of Amateur Geologists is making progress. At the last meeting, held at 31, King William Street, E.C., Mr. Henry Fleck read a paper on "Granite;" microscopic and hand specimens were exhibited in illustration of the reader's remarks.

CANTERBURY CATHEDRAL has just received a donation of geological and mineralogical specimens from the Rev. J. H. S. Sparrow. This is the first step towards the conversion of cathedrals into museums!

RICH deposits of graphite and hæmatite have been discovered in Aberdeenshire.

WE have received from Mr. W. Henshall a box of "fabric" slides, a new departure in microscopic mounting, and one which is of promise for the future, as it is calculated to render assistance in determining, by means of the microscope, the nature and quality of textile fabrics.

A VERY useful feature in the "Journal of the New York Microscopical Society" (a new publication of which we have received the first number), is a list of articles of interest to microscopists which have recently appeared in other journals. This number also contains useful matter in connection with the application of electricity to microscopy.

IT is said that the supposed new island off Iceland does not exist; that the locality has been examined by French and Danish vessels, with the result that no new island is to be found.

WE are glad to find that the University of St. Andrews (which has always been the first to recognise scientific merit by its distinctions), has just conferred the honorary degree of LL.D. upon Professor Ray Lankester.

WE are pleased to find that the Linnean Society has conferred the distinction of Associate upon Mr. J. E. Bagnell, of Birmingham, in appreciation of the botanical work he has done.

MR. S. GILCHRIST THOMAS, the inventor of the basic Bessemer process is dead, at the early age of thirty-four.

WE are always pleased to call attention to the numerous praiseworthy efforts, now being evolved among young people, for obtaining a practical knowledge of normal science. We know of none better than the "Practical Naturalists' Society," formed for the purpose of encouraging practical scientific work, &c., among its members and the collection, exchange, arrangement, and preservation of objects. The society is purely postal, and is forming a useful exchange library of reference. The hon. sec. is H. Snowdon Ward, Great Horton, Bradford.

ANYTHING which may tend to prevent those distressing collisions which too often take place between ships at sea cannot fail to be of importance. Mr. W. Balch has patented a portable rocket-firing apparatus which can be held in the hand, loaded with a rocket or shell at a breech in the tube, and discharged by a blow from the other hand. The shell when at its height bursts, producing a group of red or green stars, as the case may be, directing the on-coming vessel which way to steer her course. These rockets may also be made to give loud and distinctive reports, and can be utilised for other purposes in connection with shipping.

IT is with unfeigned sorrow we have to record the death by smallpox, of an old and genial friend both of the editor and his magazine, Mr. E. C. Rye, the well-known author of "British Beetles," editor of the "Zoological Record," and librarian of the Geographical Society. Many will miss his cheery presence, his ready wit, his abounding humour, his delightful readiness to help anyone who wanted it and deserved it.

MICROSCOPY.

ELECTRICAL MICROSCOPIC LAMPS.—"The American Monthly Microscopical Journal" contains an account, with illustrations, of various adaptations of electricity to purposes of microscopy. The incandescent lamps, in which platinum wire occupies the place of the ordinary carbon filament, are supported on jointed arms, attached either to the microscope itself, or to a separate stand, so that the light may be placed near the object, and either above or below the stage. A warm stage can also be provided, by allowing the current to pass through a spiral of platinum wire placed in the stage below the object.

LIVERPOOL MICROSCOPICAL SOCIETY.—The President, Mr. Charles Botterill, at the annual meeting recently held, read a paper on "The Theory and Practice of Microscopical Illumination." He first called attention to the importance of the subject, pointing out that no matter how perfect the microscope and its appliances might be, nor how beautiful

or well mounted the objects, the result with imperfect or unsuitable illumination must be unsatisfactory. It was a fact that illumination was very generally a weak point of microscopists; the inference being either that they were unacquainted with its principles or failed in their practical application. He then proceeded to explain and illustrate by means of diagrams the laws of reflection, refraction, total reflection, &c., so far as they applied to the subject. He next passed in review the various sources of light, of which a bright white cloud is generally said to be the best, but unfortunately it is not often available, especially as the bulk of microscopists must necessarily work only at night. Next to this, in point of purity, comes the electric light, but though it has been used with a certain amount of success it can never be much used on account of its cost and trouble, and the same applies to the oxy-hydrogen and oxy-calcium lights. Ordinary microscope lamps then are practically the best, and of these there are various descriptions, some very elaborate and costly, but it is doubtful if they are worth (except, perhaps, for very special purposes) their extra cost, and if as good results cannot generally be obtained with the less expensive ones properly managed. He then referred to the various modes of illuminating objects by transmitted light, urging the necessity of so arranging the lamp, bull's-eye, &c., as to ensure the rays of light passing to the microscope parallel to its axis. This being the light usually required not only for ordinary transparent objects, but also for polariscope dark ground appliances, &c., he expressed a strong opinion as to the advantage of using the light direct from the lamp, without the intervention of a mirror, and described a simple plan adapted by himself whereby the microscope, lamp, &c., having been once satisfactorily placed, could after removal be quickly replaced in exactly the same positions, thereby effecting a very considerable saving of time, less than one minute being required for the whole operation, from lighting the lamp to beginning to observe. After describing various modes of illuminating opaque objects, he concluded by urging all microscopists who had not yet done so to make themselves thoroughly acquainted with the construction of the microscope and its various accessories, so as to understand each part, its use and mode of action, for with this knowledge and by the intelligent application of the optical laws involved, they would be able readily and certainly to obtain results which otherwise would only be got by chance, if at all.

Mounting Insects.—In reply to a query of T. R. Brokenshire:—The best cell I have seen, or used for mounting insects whole, without pressure, is a metal cell with four equidistant projections. It was lately figured and described in the Journal of the Royal Microscopical Society. The projections on the cell are to support the cover glass, and the spaces between the projections allow the balsam or other medium, in which the object is mounted to harden. The cell is admirably adapted for the purpose for which it is intended, and is certainly a most ingenious arrangement. Mr. George Wilks, of Weaste, near Manchester, is the inventor; and doubtless a note dropped to him would bring far more information about the invention, and how to use it, &c., than I can give the inquirer.—*E. B. L. Brayley.*

Mounting Insects.—Replying to the query respecting mounting insects, &c., I beg to call attention to a paragraph on page 477 of the "Royal Microscopical Journal" for 1884. Mr. George Wilks, Salford, suggests a new cell for mounting without pressure in Canada balsam. The cell is made of soft metal, and has four elevations alternating with depressions, the cover glass resting on the upper points of the curves. By leaving an excess of balsam round the cell and cover glass, air bubbles ultimately escape through the spaces, and loss by evaporation or essential oil in the balsam is provided for. If the cell is too deep for the object, it can be pressed between two glass-slips until shallow enough. The utility of this cell has been successfully demonstrated, by Mr. John W. Miles, before the mounting sections of the Manchester Microscopical Society.—*W. S.*

Diatom Structure.—In a letter on diatom structure, which appears in the "English Mechanic" for February 6th, Dr. Wallich gives reasons for agreeing with Dr. Flögel "that in such genera as triceratum and coscinodiscus, the little hexagonal or cylindrical cavities, though completely closed by a silicious film on the internal surface of a valve, are *not* closed by any such membrane on the outer surface of the valve."

Life Histories of little-known Acari.—Mr. A. D. Michael, who has distinguished himself by his researches in this difficult and little known group, recently read a paper on the Tyroglyphidæ before the Royal Microscopical Society. In 1873, Riley published a report on the ravages of the apple-bark louse (*Aspidotus conchiformis*), and described an acarus which was supposed to destroy that pest, and which he thought might be the *Acarus malus* of Shimer. Riley only describes the female. Mr. Michael has found the acarus in England, under the bark of reeds, destroying the reeds, not feeding on any insect, and concludes that it is probably a feeder on various kinds of bark, not on animal life; he has traced the whole life-history. The male (previously unknown) presents the exceptional features possessed by the male of *Tyroglyphus carpis*, discovered by Kramer in 1881, and the hypopial nymph has been figured by Canestrini and Fanzago in 1877, under the name of "parasite of an Oribata," but without explanation. Mr. Michael finds in the life-history of this hypopus a confirmation of his views that the

hypopial stage is not caused by exceptional adverse circumstances, as Mégnin supposes, but is an ordinary provision of nature to ensure the distribution of the species, which it is intended to call *Tyroglyphus corticalis*. Mr. Michael also called attention to the prevalence of *Rhizogliphus Robini* on Dutch bulbs imported into England in 1884, and to the destructive character of that species, and the damage it did to hyacinth, dahlia, and eucharis bulbs, &c., and recommended that imported bulbs should be carefully examined.

COLE'S MICROSCOPICAL STUDIES.—All our readers will be pleased to hear that this useful and attractive publication is resumed. Four parts are now ready, dealing with the following subjects:—"The Comparative Morphology of Typical Reproductive Organs in the Vegetable Kingdom;" "The Primitive Cell and its Progeny" (Animal Histology); "Alveolar Pneumonia" (Pathological Histology); and "Popular Microscopical Studies," as illustrated by the spinnerets of the Spider. Each part is not only illustrated by an exquisitely coloured plate (whose artistic character is vouched for by the letters E. T. D.), but also by slides of the various objects specially treated upon, mounted in Mr. Cole's best manner. Plate 2 appears to be wrongly named.

ZOOLOGY.

NOTES ON THE MOLLUSCA OF NORTH HANTS.—This county has never been thoroughly searched, as regards the mollusca inhabiting it, and as I have recently found several rare species, I think it may be interesting to some of the readers of SCIENCE-GOSSIP to hear of them. Unfortunately I have not been able to extend my researches very far, the centre being Preston Candover, near Basingstoke; and I have examined the country within a radius of three miles round that centre; but even within that space I have collected over seventy species and varieties, which is, I think, above the average. The following is a list of some of the rarer sorts and varieties, which may be interesting to some. *Valvata piscinalis*, v. *depressa*; *Limnæa peregra*, and the vars. *acuminata*, *candida*, *ovata*, *labiosa*; *Ancylus fluviatilis*, var. *albida*; *Zonites alliarius* and *crystallinus*. *Helix pomatia*; as far as I can ascertain, this mollusc only occurs in one locality. *H. aspersa*, vars. *zonata*, *undulata*, and an immature specimen resembling var. *tenuis*. *H. nemoralis*, vars. *libellula*, *rubella*, *castanea*, *H. hortensis*, vars. *incarnata*, *lutea*, *castanea*; *H. cantiana*, *H. rufescens*, var. *rubens*; *H. sericea*, var. *cornea*; *H. virgata*, var. *albicans*; *H. caperata*, var. *ornata*; *H. ericetorum*, vars. *alba*, *minor*; *H. lapicida*, var. *albina*; *H. obvoluta* and *Bulimus montanus*, from Buriton. *B. obscurus*; *Pupa umbilicata*, var. *edentula*; *P. marginata*; *Clausilia rugosa*; *C. laminata*, var. *albinos* (with type); *Cochlicopa lubrica*; *Carychium minimum*; *Cyclostoma elegans*. The rest are more common than the above, and therefore would not be of such interest to the reader. I am now engaged in working up the conchology of North Hants, and would be much obliged for any notes of additional captures, and to hear of any local lists from that county.—*H. P. Fitz-Gerald, M.C.S.*

HELIX PYGMÆA.—On December 31st, I took a single specimen of this species on Barnes Common, from which locality it has not, I think, been previously recorded. It was amongst rushes in a damp situation, where one usually finds *Hyalina nitida*. Barnes Common also yielded specimens of *Limax agrestis*, var. *sylvatica*, and *Vitrina pellucida* on the same day. Vitrina is a most beautiful object when alive, as these were, and it is very little affected by cold weather, and a frost seems only to increase its activity.—*T. D. A. Cockerell, Bedford Park, W.*

LIMAX FLAVUS, VAR. GRISEA.—This variety was described by Mr. Roebuck from a single specimen taken at Bath, last year, and has not been recorded from any other district. On the 4th of January of the present year, I found a dark form of flavus at Acton, Middlesex, which I sent to Mr. Roebuck, and which he identified as belonging to the above variety. The specimen, however, was not thoroughly characteristic, since it showed traces of yellow, which in the type specimen were entirely absent. It was found in company with the type form under a log of wood. The only other point worthy of notice is that it was on the brick-earth, whereas the Bath specimen was found on the oolite.—*T. D. A. Cockerell.*

THE REPORT AND PROCEEDINGS of the Belfast Naturalists' Field Club for 1883–84, contains a long paper by Mr. J. Starkie Gardner, F.G.S., on "The Age of the Basalts of the North-east Atlantic," in which the author discusses the plant and stratigraphical evidence for the supposed miocene age of the Antrim and Mull beds; a List of Irish Coleoptera from Notes by the late A. L. Halliday, F.L.S.; an Account of the Cromlechs of Antrim and Down, by W. Gray; and Notes on the Prehistoric Monuments at Carrowmore, near Sligo, by Charles Elcock. These two papers are both illustrated, and both topographical, and should be of great use to those desirous of studying these remains.

MIMICRY.—To the "Entomologist," for February, Mr. Roland Trimen, F.R.S., contributes an account of "Protective Resemblances in Insects," in which he mentions disguises by means of which butterflies are caught by spiders. In one case he witnessed, he says, "the actual capture of a small blue butterfly (Lycænesthes) by a white spider of the genus [Thomisus]. The butterfly was engaged in honey-sucking on a white flower-head of lantana, and

explored each individual flower with its proboscis. While I was watching it, the butterfly touched and partly walked over what looked like a slightly faded or crumpled flower about the middle of the cluster. This turned out to be a spider, which instantly seized the butterfly, throwing forward its front legs somewhat after the fashion of a mantis. In this spider the effect of the little depressions on the limb of the corolla was given by some depressed lines on the back of its smooth white abdomen." This paper will repay perusal.

LAND AND FRESH-WATER MOLLUSCA OF THE MIDDLESBRO' DISTRICT.—In addition to the species and varieties already recorded (S.-G. vol. xix. pp. 163, 185, and vol. xx. p. 91) for the twelve miles' radius, having Middlesbrough for its extremity, I have pleasure in adding the following:—*Planorbis nitidus*, and var. *albida; Limnæa peregra*, var. *labiosa; Arion ater*, and vars. *marginata* and *rufa; Arion hortensis*, and vars. *grisea* and *fasciata; Limax maximus*, var. *cellaria*, and a peculiarly marked variety, at present under Mr. W. D. Roebuck's hands. Mr. Roebuck believes it to be an undescribed variety, but its peculiar coloration and markings would seem to entitle it to varietal rank, and he has proposed to name the variety *pallida-dorsalis; Limax flavus*, and vars. *colubrina* and *virescens; Limax agrestis*, and its vars. *tristis* and *sylvatica*.—*Baker Hudson.*

SINEL'S ZOOLOGICAL LABORATORY.—At Jersey visitors with natural history tastes who find their way to the Channel Islands this summer, will be immensely interested by visiting the above Institution. Mr. Sinel has enthusiastically worked the neighbouring seas for marine spoils of all kinds, and we have repeatedly drawn attention to the slides he has issued illustrative of the embryological development of the crustacea, &c. The sea-bed of the Channel Islands is a wonderful treasure-house to marine zoologists, and all those who propose to trawl, or in other ways to explore, would do well to visit Mr. Sinel's laboratory first, and there get all the information they can. The geology, mineralogy, natural history of the islands will be also found deeply interesting.

BOTANY.

WHITE PEZIZA.—While searching for the pretty scarlet pezizas in a locality where I have frequently found them, I recently discovered one, pure white in colour. It is about half an inch across the cup, and is attached to a piece of stick as the scarlet ones always are.—*H. Miller, jun., Ipswich.*

NOTES ON FASCIATION, &C.—The respect which I entertain for every original observer of plants will not allow me to contradict your correspondent who ascribes to the economy of nature phenomena which botanists in general refer to another cause; *i.e.* the cohesion of two flower-stalks, by which they become, or at least seem to be, one. This is commonly called fasciation, which has been the subject of several interesting papers in SCIENCE-GOSSIP. Fasciated stems do sometimes show such peculiarities of growth as to suggest problems to the scientific mind that are rather metaphysical than practical, but, in the case of primrose flowers on a flattened stalk, there is no difficulty in recognising the union of two pedicels, each bearing a flower on its top. Such cases happen frequently in polyanthuses, which are the subjects of cultivation. Sometimes the two flowers are distinct, at other times they are blended into one, having ten teeth to the calyx, as many lobes of the corolla, and a similar number of stamens. In other cases a calyx with ten teeth encloses two corollas, each with its normal five stamens in its tube. In the dahlias mentioned by your correspondent, the case is very different. As what is called the flower of a dahlia is in fact a capitulum or head of flowers, the stalk which bears it is not a simple pedicel, but a peduncle or flowering stem. The two flower-heads, if really collateral, must therefore be at the summits of two united stems. Whether or not two such stems are ever derived from the splitting of one, is a question as to which botanists are not quite agreed, but the prevalent opinion is in favour of the theory that two or more stems first grow together, so that fasciated stems, however apparently simple, are really compound before their component parts diverge above, or if they remain united, produce at the top more than one head of flowers. I have seen in the dandelion a phenomenon like that recorded in the dahlia. I have often had wallflowers with fasciated stems with two racemes of flowers at the top. On one occasion, saving some seeds from such a flowering stem, I sowed them, and had about twenty young plants with more than two cotyledons on each. Most of these plants afterwards produced fasciated stems, from which we may conclude that fasciation has its origin in the embryo. Further observations are, however, most desirable.—*John Gibbs.*

"FIRE-WEED."—America has the reputation of doing things on a large scale. A correspondent of the American "Botanical Gazette" gives a graphic account of a brilliant sight he witnessed in Maine last summer. A large tract of some 4000 acres had been cleared by a fire which broke out, and lasted for two weeks. Three weeks after the fire, vegetation reappeared; and in August, "our road passing through this tract for four miles, the whole region, as far as the eye could reach, over hill and valley, ridge and interval, was one mass of colour from the 'fire-weed' (*Epilobium angustifolium*). It looked, as one of the party said, as if the earth were covered four or five feet deep with a fall of pink snow."

Double Primrose.—In 1881, I had an abnormal primrose (*P. vulgaris*) brought to me; obtained at Gedling, Nottinghamshire. Its peduncle was flattened (as is described at Science-Gossip, p. 20, January, 1885). The throat of the corolla was somewhat hour-glass shaped, the general appearance of the flower giving one the impression that two flowers had become joined into one; it looked as if about two-fifths of each of two plants had been sliced away, and the two remaining (larger) parts had been joined together along their cut edges, forming one flower. Unfortunately I omitted to examine its different parts.—*C. T. Musson, Nottingham.*

The Defences of Plants.—Messrs. Foremy and Urbain have recently drawn attention to *cutose*, the substance which covers and protects the aerial organs of plants; and in a paper just read, it is shown to approach the fatty bodies in its properties and composition. Cutose resists the action of energetic acids, it is insoluble in dilute alkalies; neutral solvents have no action upon it, but boiling alkaline liquids modify its conditions.

A New Flora of Oxfordshire, including the Berkshire border, is announced to be published by subscription under the editorship of Mr. G. C. Druce, F.L.S., High Oxford, the well-known botanist, author of a Flora of Northamptonshire. The new work is to include also a history of local species and local botanists.

Blossoming of the Artichoke.—I am anxious to know whether any correspondent has already remarked upon the blossoming last autumn (1884) of *Helianthus tuberosus.* It has done so freely in South Herefordshire, though decaying immediately, so that no fructification could take place. It would be interesting to know whether this was general throughout England, or confined to the more southern counties. The blossom is insignificant compared to the size of the plant, a typical composite flower, like a miniature sunflower, about one to two inches in diameter.—*E. A.*

A Remarkable Primula.—In December 1883, my gardener sent into the house a plant of the white primula, which was then in bloom. It continued in bloom all through the winter, and the plant continued to grow; it went on throughout the summer of 1884, and is now a strong vigorous plant covered with bloom, which it has never lost. It measures now 1½ yard in circumference, and eight inches in height. It has 5 spikelets of flowers, with five to seven flowers in each cluster, and there are some more coming. The flower is single-pearl white, with crenated edges and a yellow centre. It has generally been my companion in my bedroom when in cold weather, there is a fire till about midnight, but in the summer it is kept in a cool room, with the window open all day.—*C. R. Bree, M.D., Hill House, Long Melford.*

GEOLOGY, &c.

Dolerite and Hornblende-schist.—In a paper by Mr. J. J. Harris Teall, M.A., F.G.S., on "The Metamorphism of Dolerite into Hornblende-schist, read at a recent meeting of the Geological Society of London, the writer referred to two dykes in the neighbourhood of Scourie, Sutherlandshire; of which one, the southern, is well exposed on the shore on the north side of the bay, and especially at the promontory called C'eag a' M'hàil. The peculiarity to be observed is the actual evidence of the transition of dolerite into hornblende-schist, Professor Bonney pointing out "that while others had suggested the relations in certain cases between igneous and metamorphic rocks, to the author belonged the merit of having demonstrated this in a particular instance." It was suggested that this observation might not be of very wide application in the question of the formation of schistose rocks, and the author replied that he had not argued that all hornblende-schists were metamorphosed dolerites, but only that a particular hornblende-schist had been produced in this way.

Remains of Crustacea from Brick-Earth, Wedford, Essex.—It may interest some readers to know I have obtained specimens of crustacea from brick-earth, some of which are in a capital state of preservation. The remains are principally of crabs and lobsters. I have never met with them before in brick-earth. I have studied brick-earth, boulder clay, and drift-gravels in this part of Essex for over four years, and have collected 500 specimens of fossils and rocks. Can any reader inform me if they are common or not?—*F. Challis.*

Fossil Insects, &c.—Only in our last number we had occasion to record the discovery of a fossil cockroach in the Silurian rocks of Calvados, Normandy. Now we have to mention a still more important "find," that of a fossil scorpion, discovered in the Silurian rocks of the island of Gothland, Sweden. In "Nature," for January 29, there is a capital article on "Ancient Air-Breathers," by Mr. B. N. Peach, in which an engraving is given, from a photograph, of this oldest known "air-breather." Mr. Peach suggests that it may have visited the shores of the Silurian seas to feed on the eggs of Parka and Eurypterids.

The Boulder-Clay of Lincolnshire.—In a paper on this subject read before the Geological Society of London, Mr. A. J. Jukes-Browne describes the positions of two groups of clays, the grey or blue, and the red and brown, the two types being rarely in contact. He considers that the "brown-clay series," which includes the purple and hessle clays of Mr. S. V. Wood, is of much newer date than the "blue and grey series," which he considers an extension of the upper or chalky boulder-clay of Rutland and East Anglia.

NOTES AND QUERIES.

Praying Mantis.—The insect described by W. Harvey would appear, from the description given in the November number of Science-Gossip, to belong to the empusæ; probably it is *Empusa pauperata*. The empusæ are distinguished from the genus mantis by the high projections over their eyes which Mr. Harvey described; also by the legs being furnished with small leaf-like projections. This specimen is very likely a survivor from last year. The eggs of the mantidæ are laid at the end of summer. They are placed in peculiar cases, and attached to shrubs or stones, or some such object. The larvæ are attached to the interior of the eggs, which are placed in cells, by two silken threads. On their emerging from the eggs, they are suspended in the air at the end of these threads. They then change their skin, and descend to the ground, and search about for food. After this the larvæ develop like other orthoptera.—*H. P. Fitz-Gerald.*

Motion in Spider's Severed Leg.—Mr. H. E. U. Bull, in Science-Gossip for November, mentions the fact of a spider's leg sustaining violent motion after being severed from the creature's body. This is no unusual circumstance in connection with this spider (name unknown to me), and it has always appeared to me that this severing of the leg from the body was a voluntary action on the part of the spider as a means of diverting the attention of its foes whilst it makes good its escape. For the legs appear to come off with the least touch, and moreover the spider does not seem in the least inconvenienced by the loss of one or two of its legs, as it makes off to a place of safety with all possible speed on its remaining legs. However, it would be interesting to hear the opinion of other readers of this paper on the subject.—*W. Finch, jun., Nottingham.*

Paradise Tree.—Can any reader say if there is a plant so called in Trinidad, and where we can find an account of it? We are told it cannot be moved, so it is not the bird orchid; that it dies down, or, as was expressed, "sinks to ashes every year." The blossom was described, "white, like a dove's head, with extended wings!" The party had only read of it. Can it be a "traveller's tale?"—*F. S.*

Unrecognised Birds.—On August 4th, in last year I saw two, to me, remarkable and unusual birds on a Yorkshire moor. Having described them to a game-keeper, he said they were stone-snatches; not common even on the moors, but very rare in the plains. I shall be glad if one of your readers will tell me more about this bird, for I have not been able to identify it beyond learning from the game-keeper that he calls it a stone-snatch. The colours were so bright and decided that at first I thought a pair of foreign birds had escaped from a cage. The birds were a trifle larger than a king-fisher; a sharply defined purple or peacock-green band ran from the base of the beak to the back of the head, back and shoulders yellowish-brown, tips of tail and wing feathers yellow; cry, a shrill kind of chirp; flight short and jerky.—*H. M. Birkdale.*

Carnivorous Water Voles.—I, too, believe the water vole to be carnivorous. On the banks of a canal near Nottingham (the nearest point being about two miles from that town), occurring for a considerable distance, we find numerous little heaps of freshwater shells lying in nooks and crannies, on ledges, and also in the openings of holes in the banks, most of them between the water and the foot-path, where it is from two to four feet high, in quantities varying from five to thirty or forty specimens in a heap. Hidden as they generally are by reeds and grass, they are not seen without being diligently searched for, with but very few exceptions. The species found in the heaps are: *A. cygnea*, *U. tumidus*, *U. pictorum*, and *D. polymorpha*. The shells are all broken, and invariably at the posterior margin, sometimes nearly half the shell gone, more commonly, only a small portion. Some of the shells have distinct marks, showing where an animal's teeth have slipped in trying to bite a piece out. Now, for several reasons, it is clear that no human agency will account for the presence of shells under such conditions. That the water vole lives in the vicinity there is plenty of proof—the presence of dung with the shells, for instance; and though I have never seen them, except for the fraction of a second once or twice, many times I have started them, and they have startled me with that peculiar "plop," always heard on their taking to the water; evidently having been reposing in some of the very nooks and crannies mentioned. It would seem that in this instance the water voles are in the habit of bringing up from the bottom of the water, bivalves of various species, selecting a favourite or convenient ledge in a retired spot, there to eat their meal so easily obtained. This, after a mild winter. Probably it is, therefore, a preference for animal food, and not "scarcity" of food, that is the inducement. My only doubt is whether it really is the water vole, or whether it may not be the brown rat. At Sutton-in-Ashfield (Notts) we find evidence very similar, so far as broken and marked shells are concerned. But here they occur on mud left bare by the retreat of the waters (in a mill-dam) during the past long dry summer. (In this case "birds" have also helped themselves to the supply of animal food present in great plenty in the shape of *Anodonta cygnea.*) Here, for various reasons, we conclude that rats are the probable aggressors; though it is quite likely that foxes, weasels, &c., may take their share of the food. At Lincoln, too, evidence has occurred leading to a similar conclusion as to rats feeding on anodons and unios.—*Chas. T. Musson, Nottingham.*

Water Voles.—Notwithstanding Mr. Parrot's "conjecture" of the carnivorous habits of the water vole, I continue to believe it to be entirely phytophagous. So many people have advanced circumstantial evidence against it, and so few (in fact, none at all) have had real proof of its flesh-eating proclivities that nothing short of the latter will convince me. Two days ago I had a conversation with an enthusiastic fisherman, who had seen a note of mine in Science-Gossip. He was convinced that I was wrong, and was certain that the voles fed upon dead fish, if ever they came across one. But, upon close questioning, I elicited the fact that he had never seen one so engaged during the many years he had haunted a stream where they were unusually abundant. I don't wish for one moment to say that a vole would not touch a piece of flesh if it could get nothing else, though that remains to be proved. But I do assert that flesh is very far from being even an occasional item on its menu.—*J. A. Wheldon.*

Water Shrew.—A gentleman having seen the correspondence concerning the supposed carnivorous habits of water voles, wrote to me a few days ago, and suggested that the gnawed shells, which I found, as before described in a previous number of Science-Gossip, were brought there by a water shrew (*Sorex fodiens*), which is purely an animal feeder.

This at once explains the whole matter, and it ought to have occurred to me before, as I have read about its habits, but never had the opportunity of observing them. The same gentleman, who is well acquainted with these little animals, gives the following account of their mode of feeding. "I have often seen the shrew diving for large specimens of *Limnæa auricularia* and *Planorbis corneus;* and the heaps of shells I sometimes come across, testified to the success of their efforts. They also dive for the caddis-worm, of which they are very fond, bringing each one separately to the bank and devouring it, then diving for another. I have frequently watched them when thus engaged. Their appearance under water, like that of the water-spider, resembles a ball of silver." I therefore beg to publicly withdraw my insinuations against the character of the water vole, and thus leave it no ground for an action for libel.—*F. Haywood Parrot*, *Aylesbury*.

BEETLES' BURROWS.—On turning over a stone, which lay on the roadside, in the month of September last, I noticed two holes in the ground similar to those made by dor beetles under patches of cow and horse dung, and on digging into them, I found in each a specimen of *Geotrupes stercorarius*. Perhaps some reader will kindly inform me whether these beetles are in the habit of making burrows under stones, as well as beneath dung.—*R. W. Goulding*.

BIRDS KILLED ON TELEGRAPH WIRES.—It seems to be a fact that many of our birds must perish by knocking themselves against the telegraph wires when they are flying at night; the wires being unseen by them. In the summer of 1870, when wandering at night, I started a flock of partridges, which in their rapid flight from me struck themselves with great force against a set of five telegraph wires, making the wires bend considerably, and several of the birds fell to the ground. What was the fate of those birds that fell I did not search to see, as the wires were within a railway enclosure; but I could hear them give out their wounded cries of suffering from pain. During the last autumn I examined two birds of the family Scolopacidæ that were killed on telegraph wires in this neighbourhood. One of these was a woodcock (*Scolopax rusticola*), and the other a jack-snipe (*Scolopax gallinula*). The woodcock was found dead on the morning of the 7th of November, 1884, and the jacksnipe on the 13th of November. Both these birds in general rest during the day and come forth during the night; but in the case of the jack-snipe it is believed that they rest a portion of the night, and fly in the mornings and evenings, except when the moon is very clear. The nocturnal habit of the woodcock is well made out, and the fact is well known to lighthouse keepers: the woodcock in flights reach our coasts by night, and in their bewilderment with the light of the lighthouse, they are taken by the keepers. Flights of them continue to come for seven or eight nights in succession, and hundreds perish by striking against the lamps. At first thought it appears strange that these night-flying birds should strike themselves against telegraph wires and be killed; but an examination of my meteorological register shows that on both nights when the birds were killed fog prevailed. A dissection of the two birds showed their wounds to be on the same parts of their body, viz., the base of the bill, back and wing. The birds had been in perfect health, and were very fat, and the gizzards in both were about empty; but the intestines were full of chyle. The total weight of the woodcock was ten ounces three drams, which is a light bird when compared with Dalgleish's weights of the woodcock shot at Gartincaber, near Doune, Perthshire, between 1860 and 1870, the average being between 11 and 12 ounces; the heaviest $14\frac{1}{4}$ ounces, and lightest $7\frac{3}{4}$ ounces. Whether the death of the woodcock or the jacksnipe on the telegraph wires is the most remarkable, it is difficult to hazard an opinion. The flight of the jacksnipe is wavering, somewhat bat-like, but swift; and it can turn on wing with the utmost ease; but the night when the specimen under consideration was killed, the fog was remarkable. In the afternoon and evening it was calm, very humid, rain-drops hanging on every twig, and the Valley of the Clyde was covered by a dense nimbus cloud that was only a few feet from the ground, a circumstance that naturally causes birds to fly near the earth. That afternoon, when out about four o'clock, I witnessed a flock of lapwings and rooks nearly get entangled in the telegraph wires, and these birds were accustomed to flying in the same locality. The jacksnipe is but a winter visitor, being here only between October and April, and none of them ever remain with us to breed. The woodcock is abundant with us in winter. In the autumn of 1883 it was very abundant in the neighbourhood of Johnstone Castle, and in the last autumn it was more abundant there than it has been for the last seven years. The woodcock breeds in this neighbourhood, and has also been observed doing so from Wigtonshire to the Orkney Islands. On the night when the woodcock was killed, the fog was not remarkably dense.—*Taylor*, *Sub-Curator*, *Museum*, *Paisley*.

TOMATOES.—The fact that insects avoid ground where tomatoes are planted is well known. Indeed, our cucumber-frames and marrow-beds always have a row of tomatoes planted in them, to preserve the vegetables from insects.—*C. F. W.*

LION AND TIGER.—Mr. Brenan's curious note on the Felidæ (p. 46) will, I am afraid, not bear much serious criticism. It is to be regretted that in discussing a question of classification, in which accuracy of definition is of the first moment, the terms "genus," "family," and "class," should have been used as convertible synonyms. The position of the lion in the zoological scale is briefly this: Class, Mammalia; Order, Carnivora; Family, Felidæ; Genus, Leo. Taking it for granted that the class and order are not called into question, although it is literally contended that lions should have a separate class, we may premise that the basis of classification is structural intimacy, rather than similarity of habit and appearance. It will therefore be clear that the family is rightly chosen, as the only, or at any rate the chief digitigrade carnivorous families besides the Felidæ (cats), are the Canidæ (dogs) and the Mustelidæ (weasels). The comparative scarcity of molars and premolars, and the presence of recurved papillæ on the tongue—typical of the lion—are two of the most unmistakable marks of the Felidæ. Dealing with the points of difference referred to, it may easily be shown that as departures from the normal type, they are not confined to the lion. He is charged with not having (*a*) the power to climb. But the tiger, an undoubted feline, is no climber. (*b*) A retractile claw. But, granting this to be true, and it is open to grave doubt, the claw of the cheetah (*Gueparda jubata*) is, on the authority of many, only partially retractile, if at all. (*c*) A sylvan habit. But this is the case, to much the same extent, with the puma (*Leopardus concolor*). (*d*) A marked skin. But the puma is only so marked in infancy, acquiring with age a skin as plain as the lion's. In fact one

would expect leonine cubs to show traces of markings, although I cannot say without reference whether they do so or not. Lastly, placing the lion and tiger in the same genus (Felis) is not attempted, as the lion constitutes the genus Leo, the tiger Tigris, and the wild cat and its congeners Felis, all three genera making up with others the cat family.—*Ernest G. Harmer.*

HYBERNATION OF CUCKOO.—I see that W. P. is exercised about the hybernation of a cuckoo. Such a hybernation has been known before. I remember having read somewhere (I believe in White's "Selborne"), that a bundle of sticks was on a certain occasion brought into a room, and the heat roused a cuckoo which was hybernating in the bundle. This is even a more extraordinary case than that mentioned by W. P., and goes to confirm the truth of his statement.—*F. H. Perry Coste.*

BATS.—As another correspondent mentions the fact that bats are seen flying in Maidstone in mild weather in winter, it may interest him to know that according to White, bats fly whenever the temperature is above 56 degrees. (I quote from memory, but believe I am right in the number.)—*F. H. Perry Coste.*

FLINT OR STONE IMPLEMENTS.—I should be greatly obliged if any of your readers can inform me if any such implements were found in the peat on the wild moors of Allendale, Northumberland? Where were they found, and what kind of stone were they composed of?—*J. R. Hewitson, Mirfield, Yorks.*

STICKLEBACK.—Can any readers kindly enlighten me as to the cause, or probable cause of this fish turning an iridescent colour after death? The reason the bodies of sticklebacks become such beautiful colours during life, I believe is due to the excitement which at such times is generally prevalent. As to how these colours, the predominant of which is brilliant red, are exhibited by the fish, full particulars concerning it will be gratefully accepted by me.—*A. H. Fry.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

INVESTIGATOR. — Harvey's "Phycologia," 3 vols., with coloured illustrations of species, deals with British marine algæ; the "Phycologia Australis" deals similarly with southern species. The "Treasury of Botany," 2 vols., is a work such as you require, each short paragraph being written by a specialist. No dictionary of natural history is out, except that of Beeton's, which would not come up to your requirements. Get Cassell's "Natural History," 6 vols., edited by Prof. M. Duncan.

H. W. D.—The best way of killing the small animals you mention is by means of chloroform.

W. BOARDMAN.—The "Botanical Gazette" is an American periodical, published at Indianapolis.

ARION.—Address Mr. J. W. Taylor, St. Ann Street, Leeds, for information as to the Conchological Society.

R. F. Z.—The theories about the American gas and oil wells have been published in various American Geological Survey works. There is little doubt they originate from rocks rich in organic matter, and the latter is distilled by the heat in the interior of the earth.

A. E. HUDSON.—For all details concerning the Botanical Record Club, inquire of Mr. Charles Bailey, F.L.S., Ashfield College Road, Whalley Range, Manchester. For Botany of Switzerland, see the articles by Dr. De Crespigny, published in SCIENCE-GOSSIP four years ago.

A. P.—In spite of the terracotta representation of a stork carrying off a child, we do not think those birds are guilty of the trick! It would have to be a much more powerful stork than any we know of to carry off a child.

J. HAMSON.—Get Mr. English's book (price 2*s.* 6*d.*), on "How to Preserve Fungi with all their Colours." Address him at Epping, Essex.

G. E. A., JUN.—The volumes of the Palæontographical Society are published annually to members, who subscribe one guinea a year. Apply to the honorary secretary, the Rev. Thomas Wiltshire, 25 Granville Park, Lewisham, London, S.E.

J. S. H.—From your description, we have no doubt the object you mention, obtained during your friend's voyage, is the glass rope-sponge (*Hyalonema mirabilis*).

LEDAIG.—The specimen you sent is purple sandpiper (*Tringa maritima*).

J. HART.—We thank you for your kind offer.

JAMES SIMS.—Your letter to hand, but the moss is missing.

F. M. P.—See SCIENCE-GOSSIP, 1883, Nos. 225 and 226, for "A New History of the Sparrow."

C. A. M.—You cannot do better than get Shuckhard's "British Bees" (with illustrations), published by Lovell Reeve and Co., at 10*s.* 6*d.*

R. CAIRNS.—Davis's monograph, "On the Fossil Fishes of the Carboniferous Limestone," may be obtained, we should imagine, of the secretary of the Royal Dublin Society. Apply to him.

W. H. B.—Your specimens are: (1) *Filago Gallica*; (2) *Trifolium procumbens*; (3) is too obscure even to guess at.

J. CHALLIS.—Your specimens (from Broomfield, &c.) are not from the Boulder clay at all, but from the London clay. No. 1 is a phosphatic nodule, just as formed in the London clay. These nodules, when washed out of the London clay and re-deposited in the crag beds, form the well-known "Coprolites" of the latter formation. No. 2 is a fragment of hardened sand, whose particles are coated with manganese. No. 3, a cluster of macled crystals of Selenite, from the London clay.

EXCHANGES.

GOOD botanical, histological, crystals, polariscopic, diatoms, fish scales and miscellaneous, microscopic slides for others as good of bacilli, entozoa, algæ, desmids, zoophytes, rocks, fossil woods.—B. Wells, Dalmain Road, Forest Hill.

OFFERED, specimens of *Cynomorion coccineum* in exchange for works on natural history.—Cajetan Platania Platania, Via S. Giuseppe 14, Acireale, Sicily.

DUPLICATES: *Helix scabriuscula, Fissurella neglecta, Haliotis lamellosa*, and many other Sicilian land and marine shells. Desiderata: British and foreign land and marine shells.—Cajetan Platania Platania, Via S. Giuseppe 14, Acireale, Sicily.

OFFERED, six-chambered pin-fire revolver, nearly new, and cartridges. Wanted, skates (full size), good coins, or other things.—A. W. Harrison, Edith House, Parchmore Road, Croydon.

OFFERED, mounted specimens of the wonderful and beautiful lichen *Ramalina reticulata*, also specimens of *Usnea barbata*, in exchange for rare lichens, ferns, or shells.—J. Reed, Santa Clara, Santa Clara Co. California, U.S.A.

A VERY good collection of English lepidoptera, well set and in fine preservation, including several hawk-moths, for sale or in exchange for works on Natural History. List sent on application.—F. Hayward Parrott, Walton House, Aylesbury.

A VERY fine and complete collection of fossils from the chalk of Surrey and Kent (specially rich in sharks' palate teeth, both in variety and number) together with a collection of minerals and crystals (including a group of amethyst crystals 40 inches in circumference, and a slab of flexible sandstone) will be exchanged for English coins in fine preservation.—A. B., 97 Burton Road, Stockwell, S.W.

SPECIMENS of *Urania Sloanei* in exchange for good micro camera lucida, or good photographic wide angle lens, or offers.—J. Hart, Gordon Town, Jamaica.

HUGH MILLER'S "Old Red Sandstone" (1882) and SCIENCE-GOSSIP in part, complete from 1881 to 1884 for good rock-sections.—E. Halse, 15 Clarendon Road, Notting Hill, W.

THIRTY different starches mounted in balsam, for exchange. Desiderata: insects' eggs, parasites, pollens, gorgonias and histological sections.—N. Irving, 16 Acomb Street, Manchester.

LAST six years' numbers of SCIENCE-GOSSIP for exchange. Offers wanted in slides, books or micro-material.—J. Beaton, M.A., 219 Upper Brook Street, Manchester.

"British Wild Birds" from number 1 to 26, both unbound. Wanted, Darwin's "Insectivorous Plants," and "Variation of Animals and Plants under Domestication."—F. Willoughby, St. Paul's Square, Birmingham.

Wanted, Foreign and English beetles, will exchange Foreign and English Coleoptera and Lepidoptera. Will correspond with foreign Coleopterists.—D. Dods, 47 Chepstow Place, Bayswater, W.

British silver coins, in good preservation of Henry, Edward, Elizabeth, Charles, Anne. Also Roman coins, silver and copper, offered in exchange for flint stone or bronze implements.—R. McAldowie, 12 St. Nicholas Street, Aberdeen.

Stained sections of *Cobœa scandens*, *Ilex Aquifolium*, and several other botanical slides, in exchange for other well-mounted slides. Lists exchanged. J. William Horton, Brayford Wharf, Lincoln.

Wanted one or two examples of bone, shell, or stone fish-hooks from South Sea Islands, or the Eskimo or American Indians. Liberal exchange offered in crustacea, mollusca, rocks, or micro-slides of marine objects. E. Lovett, 43 Clyde Road, Croydon.

For exchange or otherwise. A fine mahogany, 40 drawer microscopic slide cabinet with panel door, &c., to hold 1920 slides, flat.—E. Lovett, 43 Clyde Road, Croydon.

Wanted, old English coins. Six flakes from the neighbourhoods of Dover and Hemel Hempstead offered in exchange. A coin of the above description, of the value of about one shilling. —B. Piffard, Hill House, Hemel Hempstead, Herts.

Wanted, perfect, correctly named, British and Foreign butterflies, in exchange for some good bulbs of liliums and other hardy flowers, British shells, and a few Paris basin fossils (named).—J. T. R., Spring Cottage, Dee Banks, Chester.

Objectives wanted of half an inch and higher, and other micro-apparatus to exchange for micro-slides, collections of phanerogams and mosses, or botanical works.—J. Harbord Lewis, F.L.S., 145 Windsor Street, Liverpool.

Offered, mountain hare stuffed, new, without case, and Science-Gossip unbound, March to May, 1880, and Aug. 1880 to Dec. 1882: wanted uncommon British mammals, skins or in flesh —J. Kelsall, Ball. Coll., Oxon.

Wanted a polariscope for microscope. Will give 5 vols. (1877–81), "Popular Science Review," bound and in good condition.—F. Adams, 92 Upper Alma Street, Newport, Mon.

Well-blown eggs of golden-winged woodpecker, spotted sandpiper, Leache's petrel, and red-winged starling, to exchange for others not in collection.—Dr. J. T. T. Reed, Ryhope, near Sunderland.

Wanted a good second-hand slide cabinet to hold at least 500. Apply, stating price, or exchange required, to W. Irving, 16 Acomb Street, Manchester.

Wanted the vols. or numbers of Science-Gossip from the beginning to the end of 1872; also any of G. Eber's novels, translated from the German. Will give in exchange good slides, various.—J. J. Andrew, L.D.S.Eng., 2 Belgravia, Belfast.

Diatoms.—Exchange twelve prepared tubes of diatoms (from different parts of the world), for three well-mounted insect slides.—F. Cresswell DuBois, 15 West Cromwell Road, Kensington.

Botanists and others in all temperate regions are cordially invited to enter into correspondence as to the collecting of bulbous plants with a view to exchange for other similar plants, not indigenous to their districts; or to exchange for Geological, Conchological, and other Natural History specimens.—J. T. R., Spring Cottage, Dee Banks, Chester.

Chessylite, bloodstones, jet, actinolite, wood opal, pyromorphite, specular iron, erubescite, dolomitic limestone, graphite, polished madrepores, practical microscopy by George Davis (new); "Human Race," by Louis Figuier (new). British tertiary fossils.—Wanted fossils from tertiary formations of France, Italy, and Germany. Also rare British and foreign shells.—Miss Linter, Arragon Close, Twickenham.

Foreign butterflies, *Orn. brookiana*, (Sumatra); *Morpho. cypris* (Bogotá); *Mania rhypheas* (Madagascar); the three most splendid butterflies known; also wings of brilliant species for microscopic purposes. Rare papilios much wanted for figuring, condition immaterial, over two hundred already figured.—Hudson, Railway Terrace, Crosslane, near Manchester.

Two hundred and twenty foreign stamps used and unused, valued at 21*s.* in exchange for entomological apparatus, or good collection Lepidoptera, or Coleoptera.—Thomas Mackie, 162 James Street, Bridgeton, Glasgow.

Offered, Rye's "British Beetles," 10*s.* 6*d.*, sixteen coloured plates; wanted, "Common British Fossils," by Editor of Science-Gossip; or what offers?—T. Brewis, Boro' College School, Rotherham.

Offered, Cyclostyle, complete, quarto size. Wanted, equivalent in physiographical or geological books or implements.—T. Brewis, Boro' College School, Rotherham.

Offered Science-Gossip for 1883, new, bound, also "The Mysteries of Creation Solved" (new); also "Six Months on Duty" (new), for works on Astronomy and Natural History.—W. M. H., Alstonfield School, Ashbourne.

Wanted, *Vertigo lilljeborgi* (West), *V. tumida*, *V. alpestris*, *V. pusilla* and *V. minutissima*. Other British land and fresh-water shells in exchange.—W. Gain Tuxford, Newark.

Duplicates: Atalanta, Io, Cardui, Galathea, Semele, Tithonus, Hyperanthus, Egerides, Alexis, Phlœas, Bucephala, Caja, Lucipares, Meticulosa, Oleracea, Fluctuata, Rhomboidarea, Cratægata, &c. Wanted, other Lepidoptera.—F. H. Perry Coste, 15 Bruce Grove, Tottenham, N.

Science-Gossip, wanted the following Nos., 43, 46, 51, 52, 55, 59, 67, 68, 72, 76, 83, 84, 210, 212–216, and for 1865–67, 1883, and 1884. Numerous exchanges, periodicals, books, slides, Natural History specimens, &c.—W. T. Taylor, Seymour House, Keswick.

Will give chalk, gault, lower greensand, and post-tertiary fossils, also land and fresh-water shells, for British lepidoptera, micro-slides, or books.—A. Beales, 37 Kingsley Road, Maidstone.

Will exchange parts and first 6 vols. of Science-Gossip for "Zoologist," or bird skins in good condition.—J. R. Hewitson, Knowle, Mirfield, Yorkshire.

Wanted, eggs of moths, &c., for mounting.—R. J. Cowling, 47 Dockley Road, S.E.

Will collect and forward specimens of shells, marine and land seaweeds, and, during the coming season, butterflies from counties Dublin and Wicklow. Lists sent.—John R. Redding, 165 North Strand Road, Dublin.

A few micro-slides of archegonia and antheridia of mosses and hepatics to exchange for other good slides; send lists to W. G. Green, 24 Triangle, Bristol.

Exchange offers requested for "Science for All," vol. i. and last monthly parts; "Amateur Work," 3 vols., and last parts; "European Ferns," eighteen 7*d.* parts; "Cassell's Popular Educator," cost 50*s.* "Beale on the Microscope" wanted.—H. Ebbage, Halesworth, Suffolk.

Wanted, batches of living *Helices aspersa*, *nemoralis*, *hortensis*, and *arbustorum*, from different soils; exchange land and freshwater shells.—B. Hudson, 15 Waterloo Road, Middlesbrough.

Wanted, to exchange upwards of 100 species of North American eggs, all side-blown, in complete clutches, with full data, for clutches of eggs on British list. Correspondence solicited by—W. Wells Bladen, Stone, Staffordshire.

Exchange for other land or freshwater, fine *Anodonta anatina*, *A. cygnus*, *Unio pictorum*, *U. tumidus*, *Unio* sp. America, *Paludina vivipara*, *Limnea auricularia*, *L. stagnalis*, *Helix pomatia*, *H. aspersa*, *P. corneus*.—James Ellison, Stecton, Leeds.

Wanted, to exchange "Knowledge," vol. v., January to June, 1884, for the "Postal Microscopical Journal," 1884.—J. B. J., 145 Highbury New Park, London.

Wanted, first seven numbers of "Knowledge," also Nos. 36, 40, 86, 115; will give in exchange micro slides, apparatus, or books. Physiological slides to exchange for others of interest. —W. Tutcher, 22 North Road, Bristol.

Skins of spotted eagle, male and female; exchange for Iceland or Greenland falcon.—Henry Walton, Birtley, Chester-le-Street, co. Durham.

Wanted, birds' eggs, named and side-blown, in exchange for exotic and British butterflies and moths, also a good second-hand cabinet for birds' eggs.—R. Garfit, Vine House, Alford, Lincolnshire.

Wanted, good material for mounting, more especially insects (in spirit); will give well-mounted slides in exchange.—Charles Collins, Bristol House, Harlesden, N.W.

BOOKS, ETC., RECEIVED.

"The Collector's Manual of British Land and Freshwater Shells," by Lionel E. Adams. London: George Bell & Sons.—"The Student's Botany," by C. MacDowell Cosgrave, M.D. Dublin: Fannin & Co.—"Medical Annual for 1885," edited by Dr. Percy Wilde. London: Henry Kimpton.—"Cactaceous Plants: their History and Culture," by Lewis Castle. 171 Fleet Street. — "Popular Science News" (Boston). — "American Naturalist."—"Report and Proceedings of Belfast Naturalists' Field Club."—"Science."—"Journal of New York Microscopical Society."—"Belgravia."—"Gentleman's Magazine."—"Midland Naturalist."—"Ben Brierley's Journal." &c. &c.

Communications received up to 11th ult. from:—M. A. M—E. W. O'M.—J. E. R.—F. H. P.—J. A. W.—R. W. G.—J. H. M.—R. L. H.—A. B.—E. K. L.—J. S.—F. M. P.—J. H.—E. H.—F. S.—H. M. B.—A. W. H.—J. S. C. T. M.—F. W.—D. D.—E. G. H.—C. A. M.—W. I.—T. D. A. C.—J. M. B. T.—R. McA.—J. F. C.—J. H. L.—J. T. R.—E. B. L. B.—J. B.—E. L.—J. W. H.—A. E. H.—A. K.—J. E. K.—F. C.—F. A.—W. S.—J. J. A.—L. C.—C. P.—J. T. T. R.—C. F. W.—W. I.—F. C. D. B.—J. H.—C. C.—A. A. R.—B. W.—R. C.—W. E. G.—J. T. R.—J. E. L. —H.—A. W. F.—T. M.—T. W. B.—W. M. H.—W. T. T.—J. W.—G. M. B.—E. A.—F. H. P. C.—W. G.—A. B.—J. R. H. —R. J. C.—H. F.—R. D.—A. H. S.—J. R. R.—A. M. P.—G. E. E.—H. E.—F. S.—B. H.—W. H. B.—W. W. B.—J. E. —J. B. J.—W. T.—W. B.—A. H. S.—W. S.—W. O.—H. W. —C. C.—A. E. R.—R. G.—C. P. P.—H. S. W.—H. C. C.—S. C. C.—&c.

GRAPHIC MICROSCOPY.

E.T.D. del, ad nat. Vincent Brooks, Day & Son lith.

EGGS OF VAPOURER MOTH.

× 30

GRAPHIC MICROSCOPY.

By E. T. D.

No. XVI.—Eggs of Vapourer Moth.

THE outer "shell" (if it may be so called), of the eggs of the majority of insects is composed of a chitinous membrane, of such protective toughness, that the eggs are frequently found in the crops of insectivorous birds, mixed with digested portions of food, so intact and unaltered in form, colour, and integrity, as possibly to be found to retain even their vitality. In the article accompanying the plate of the egg of the house-fly in the October 1884 number of this journal, on page 218, an authentic case is referred to, of the eggs of the vapourer moth (*Orgyia antiqua*) having been found in large numbers in the intestines of a cuckoo, which was captured last August in the garden of the old Charterhouse School, London, and a detailed account of the circumstances published in the "Field" newspaper on the 30th of the same month. The present illustration shows a group of these eggs, after having been extracted, washed, and carefully dried; although the experiment was not tried, it is possible they might have been hatched.

The regularity of the various forms of the eggs of insects, added to exceptional appearances of colour, markings, and even sculptures, render them peculiarly attractive as microscopic objects. As a distinct subject of interest, they offer great diversity and beauty—unlike the eggs of birds, exhibiting external appliances, strange structural appendages, fringes of extreme delicacy, eccentric forms and curvatures, with lids, and caps of various devices to aid the emission of the larva.

It is not unworthy of note, that sculptured surfaces of rare beauty, raised nodules, pitted depressions, surrounded with ridges arranged with geometrical precision, radiating from the base to the apex, as found in the eggs of some insects, are peculiarities frequently seen in minute, and isolated germ life, in unicellular plants, the cells of desmids, diatoms, minute seeds, spores, and particularly in pollen granules where external appearances take the most singular and elegant forms.

The collector of the eggs of insects must be guided, in his explorations, by the habit of the parent. The suitable deposition of the egg, and its future development, depend on the supply and position of the food; it would be impossible to conceive an organism in a more helpless condition than a larva just emerged, unless it found itself surrounded by, or within reach of, abundant nutriment; the eggs of all leaf-eating caterpillars are consequently deposited on the branches, and in the interstices of the trees themselves, or in close proximity. Particular trees or plants, probably with some regard to locality and aspect, are selected by different species. In some cases the parent collects and stores the future food, depositing an egg in a cell, and packing it with just the amount required by the larva, anticipating a supply in proportion to the size of the cell which invariably is a sufficient, and an exact, quantity. Many of the vegetable-feeding beetles maintain the preservation of the future progeny by rolling up balls of food, in which is enveloped an egg—a case where the individual is evidently of less importance than the perpetuation of the species, the chances of survival being enhanced by the separate isolation of the egg. It is engagingly interesting to consider the powerful impulses which induce such actions; involving favourable positions, selection of herbage, and often temperature and moisture, as affecting the putrefaction or fermentation of organic substance in which the young maggots may revel, an impulse without doubt emanating from maternal presentiment

—for, in many cases progeny are actually nursed and protected by the parent, even supported and supplied with untiring zeal. As a rule insects are only destructive in a larval state—destructive, in many instances, in the sense of being beneficial. In that condition, development is rapid, and the chief business of life, *i.e.*, the preparation for a higher and more important condition, is performed.

In consequence of the minuteness of eggs of insects, and the extraordinary care taken in depositing them, they frequently baffle detection, but it is certain few localities escape, and they may be sought for in the most unexpected, and apparently unlikely places. Many singular instances might be mentioned: the larvæ of the *Curculios* feed on the developing seeds of plants, the eggs are deposited in the flowers, and during growth, the hatched larvæ bore through the soft tissues of the "receptacle," and devour its contents. In the larger order of the lepidoptera extraordinary care is exhibited, even to the extent of mechanically providing protection by enveloping the eggs in peculiar coverings, or securing a defence with glue-like varnishes of considerable tenacity. The life-duration of the egg condition, is often a factor. Many moths only deposit on fruits just ripening, a matter of days, and adjustment of time; unripe fruits are never touched. The cocci, or scale insects (infesting peach-houses, and conservatories), fix themselves firmly on the leaves and brood over the eggs; even after death the body forms a tent or covering under which the young remain until mature.

The orthoptera dig holes in the earth and deposit eggs in groups, enveloped in some instances in a case. As in this order the young when hatched immediately exhibit the lively appearance, appetites, and instincts of the parents, and are capable of at once seeking food, a storage of provision, or a contiguous supply is unnecessary. Living and growing tissues are often the nidus and receptacle of eggs. The gad-fly (*Tabanus*) has a sheath capable of penetrating the skins of animals, and not only depositing the egg, but of setting up a condition of excitement necessary for the future preservation of the young. The means and instruments employed are endless; the various forms of ovipositors is a subject in itself. They are capable of cutting into, and boring beneath the cuticles of leaves or the rinds of fruits, leaving an egg in the parenchyma, with the addition of a corrosive fluid of such virulence as to excite abnormal growths in aid of the sustenance of the future larvæ, producing contortions of tissues, and excrescences, as in the well-known gall-nut; a curious reciprocity as affecting the functions of the plant, and the requirements of the insect.

Space does not admit the pursuit of this interesting subject; our younger readers must be referred to Kirby and Spence's most charming Introduction to Entomology.

Among remarkable forms may shortly be specified, the yellow eggs of the cabbage butterfly (*Pieris brassicæ*), the puss moth (*Cerura vinula*), the privet moth (*Sphinx ligustri*), the transparent eggs of the honey bee, the cockroach, the cricket, and the eggs of most of the parasites, especially those infesting the pheasant. Many of these open longitudinally through well-marked sutures aided by the tension of curvature. For the cabinet, eggs are easily prepared as opaque objects, and it is not difficult to arrange them for observation on the stage of the microscope, in a living condition, showing the movement of the larva within, and with patient watching, its ultimate emergence.

Crouch End.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

A VERY interesting paper on labour and wages in America was read at the Society of Arts by Mr. D. Pigeon, the Hon. J. Russell Lowell in the chair. Among many other facts proving the superior education afforded to artizans there, he showed that the number of public schools in the United States is 225,800, or one to every 200 of the entire population of both sexes and all ages. In Massachusetts alone there are nearly 2000 free libraries, or one to every 800 inhabitants. No wonder then that Mr. Lowell was able to say that "one thing he thought he had noticed in the real American workman, was the amount of brains which he mixed with his fingers," as compared with the workmen of other countries. Now that science is interfering with every kind of industry, this ability to mix up brains with fingers will determine the destiny of nations. Not only the arts of peace, but also the grim business of war, is dependent upon science. The victory of the Germans in the Franco-Prussian war was largely due to the mixing of brain with fingers, in the handling of delicate arms of precision, and the intelligent use of maps by common soldiers.

At the meeting of the Chemical Society, on 19th February, Mr. E. C. H. Francis described a simple but very valuable discovery, viz., that if filter paper be immersed in nitric acid of 1·42 sp. gr., and washed in water, it becomes remarkably toughened without losing its porosity, as when treated with sulphuric acid in making parchment paper. We are told that the paper treated with nitric acid may be washed and rubbed without damage, like linen. It contracts and loses a little weight, but contains no nitrogen. The weight of its ash diminishes, which is an advantage in analytical chemistry, especially in rough and ready commercial analyses where the ash is neglected. As non-chemical readers may not otherwise appreciate the important position held by filter paper in an analytical laboratory, I will explain

that in most cases the quantity of a given substance is determined by dissolving the mixture in which it is contained, and then adding a precipitant, which throws down the substance in question in solid insoluble form, usually a compound of known composition. The solid is separated by filtration and weighed. The filtering agent must be removable, and blotting paper answers the purpose admirably. If the precipitate is incombustible, the paper is burned with its adhering precipitate, which is then weighed. Otherwise, it is weighed on the paper, after drying; another piece of paper of equal size and proved equal weight, being used as counterpoise. Specially made paper that leaves but an infinitesimal ash is used.

In the Records of the Geological Survey of India, vol. 17, is a memoir by Dr. W. King, on the "Smooth Water Anchorages of Narrakal and Alleppy," on the Travancore Coast. These remain smooth even when the surface of the sea outside is torn by the south-westerly moonsoons into white surf-topped billows. The explanation of the mystery is simple enough, and is interesting, as affording further evidence on the disputed question of oiling the waves. The bottom of these anchorages is a soft, unctuous mud found to contain oil, and from it is a continuous oozing upwards of petroleum. My friend Arthur Robottom describes a similar calm region on the Californian coast, but at some distance out at sea. Here the oil wells up in large quantities, spreads visibly over the surface and effectively becalms a great area around the spring. Franklin's experiments on the ponds of Clapham Common, and his conclusion, that the oil prevents the wind from taking hold of the water, by acting as a lubricant against the wind-friction, are confirmed by these cases, by the experiments at Peterhead, and by all that has since been learned on the subject.

In the same volume is an account of a fiery eruption from one of the mud volcanoes on Cheduba Island, where a body of flame 600 feet in circumference is said to have at one time reached an elevation of 2400 feet. Petroleum again. The earth evidently contains a much larger store of petroleum than is usually supposed.

Very few people appreciate the interesting collection of meteorites in the British Museum. The majority of ordinary visitors pass through the whole of the show without seeing them at all. A very interesting addition is about to be made to this collection—will possibly be there when this is printed. It is a meteorite, weighing 46 kilos (101½ lbs.), which was discovered in the autumn of 1882, near Durango, in Mexico, at a depth of about a foot. The slight depth and other indications have led to the inference that it had fallen quite recently. Its composition is: iron, 91·78; nickel, 8·35; cobalt, 0·01; with traces of phosphorus and carbon. Specific gravity, 7·74–7·89.

The detection of the ordinary adulteration of milk by water is unsatisfactory, on account of the varying composition of the milk from different cows, and even from the same cow at different periods. The milk of an Alderney or Jersey cow may be much diluted, and yet, when tested by the proportion of water to cream, shall come out richer than the milk from some other cows when unmixed. The method recently introduced by M. Sambuc is said to overcome this difficulty. Experiments made by him in 1879, and in October and November of last year, show that the serum of the milk—that which is left when the casein and cream are removed, varies very little in specific gravity, never falling below 1·0278. To effect its separation, the milk is heated to 40°–50° C. (104° to 122° F.), and an alcoholic solution of tartaric acid is added. After about a quarter of an hour the mixture is taken from the fire, agitated with a small bundle of twigs, and strained through a linen filter. The specific gravity of the serum or whey is then determined by a lactometer.

In Dingler's "Polytechnisches Journal," vol. 254, p. 443, is an account of a method of enamelling casks invented by F. G. Sponnagel, and apparently not patented. Instead of coating the wood with enamel, the cask or vat is first treated with an aqueous solution formed by fusing 100 parts of silica with 50 parts of alkali, and when this has penetrated the wood thoroughly the cask is filled with a solution of aluminium acetate in water mixed with sulphurous acid in the proportion of 4 : 2 : 1. This effects a precipitation of neutral enamel of silicate of alumina within the pores of the wood. Assuming that such precipitation is successfully effected, we obtain in such internally enamelled wood a material of great usefulness for a multitude of purposes besides cask making.

In the same volume of the same Journal, page 399, an honest method of manufacturing soap is described. Perhaps I should explain what I mean by honesty as applied in the manufacture of soap. Shrewd, observant house-wives know that bars of soap when stored in a dry place have a curious habit of shrinking, and that the amount of shrinkage varies with the samples. Not very long ago a petty fraud was rather extensively perpetrated by a gang of vagabonds, who strolled from door to door in poor neighbourhoods, offering "salvage soap" for sale. They told a tale of the shipwreck of a cargo of soap, and how it was damaged by sea water, how they had bought it cheap and could sell at three-halfpence or twopence per pound. The soap was sufficiently wet to correspond with the story. It contained 70 or 80 per cent. of water, on the evaporation of which a long bar shrivelled to a short twisted stick. Ordinary soap of fair quality contains 20 to 25 per cent. of water, but may be made to contain much more, even the salvage quantity. Pure soap is a compound of fatty acids with alkali, no free alkali remaining. Such remaining alkali renders it irritant to the skin, though suitable enough for washing greasy clothes or very dirty

people. In these cases the free alkali combines with the exuberant grease. In common yellow soap more or less of the fatty acid is replaced by resin.

The novelty to which I refer is the use of a centrifugal machine or drum, which is made to rotate very rapidly while containing the crude soap before it has been cooled. All the alkali or salt is thereby separated, and a larger quantity of the water; the soap is very dense and perfectly neutral, and therefore non-irritant. I may add, by way of warning, that among the fancy soaps is a vile compound, in which the fatty acids are more or less replaced by silicic acid. It is very smooth, lathers admirably, but treats tender skin most cruelly. One of the indications of the adulteration and of saline impurities generally is the efflorescence of very pretty crystals on the surface of the soap as it dries.

A more recent contribution of science to domestic economy has been discussed by the Hygienic Council of the Department of the Seine at Paris. It is the use of vaseline as a substitute for butter or fat in pastry. It appears that the chief motive of the pastry cook in adopting this "improvement" (?) is to obtain a pastry that will keep longer. From the tradesman's point of view this may be a desideratum, but to the consumer it is not so advantageous, seeing that this mineral grease is absolutely indigestible. It may slip through the digestive organs by virtue of its lubricating properties, and carry with it the particles of flour, sugar, &c., which it envelopes, but it cannot be assimilated, and probably protects the materials with which it is incorporated from the action of the digestive solvents. The strongest mineral acids do not disturb vaseline, neither do the most caustic alkalis saponify it. In the pastry it comes as vaseline and goes as vaseline, and probably does mischief in the course of its journey through the body. "The Council therefore advises that its use for pastry making shall not be permitted in France." Let us hope that such use may not be permitted in England.

While M. Perrotin, director of the Nice Observatory, was making an observation on Hyperion, one of the satellites of Saturn, the object suddenly dashed to the right of the spider-line of the telescope, and then returned. It was the telescope that moved, and the earth that moved the telescope. A slight but sharp earthquake tremor occurred. This incident suggests a delicate means of measuring such movements.

We have received the first number of a new monthly periodical, the "Journal of Mycology" (Manhattan, Kansas). It is intended to be a medium for the publication of matter of mycological interest; to note the discovery of new species of fungi, to give an account of the literature of the subject, and so assist in the extension of North American mycology in general.

THE VARIATION AND ABNORMAL DEVELOPMENT OF THE MOLLUSCA.

THE variation of the Mollusca is an exceedingly interesting subject, but it is as vast as it is interesting. There seems to be hardly a species which, if sufficiently studied, does not present here and there some marked difference from what is known as the typical form; and some, as *Helix nemoralis*, are so variable, that two exactly similar specimens are rarely found. And this variation does not seem to rest on mere chance, but varieties are often local, abundant at one place, and not to be seen in the surrounding country: and, strangely enough, this localness seems also to be to a certain extent peculiar to what are generally called mere monstrosities. I mean the sinistral, scalariform, and decollated forms. Miss Hele, in SCIENCE-GOSSIP, records the occurrence of three sinistral *Helix aspersa*, and two *H. hortensis*, all in the same lane, and I cannot think that this was purely accidental; there must have been some reason for these shells becoming reversed, but what that reason may be, I cannot imagine. On Chislehurst Common I took a specimen of the monst. *scalariforme* of *Limnæa stagnalis*, having the whorls almost disunited, and the suture between the fourth and body whorl forming an acute angle. This specimen was found in a very small pond, where the typical form of *L. stagnalis* does not occur, but the pond is crowded with a variety, which is smaller than the type, and has a deeper suture. In the same pond my brother took another scalariform *L. stagnalis*, and he also found a third specimen in a pond not far off. Another brother (L.M.C.) has taken *L. peregra*, monst. *scalariforme* at St. Mary Cray, two miles from Chislehurst, and a scalariform *Helix aspersa* on Chislehurst Common. Whether there is any connection between the occurrences of these scalariform shells I do not know, but, if so, I suppose it must be due to the soil, or possibly, but not probably, to some parasite. I fancy the food has little or nothing to do with it, but I may as well mention that the pond in which the two scalariform *L. stagnalis* were found, contained *Ranunculus aquatilis*, and *Potamogeton crispus*, and the pond in which the other one was found contained *Anacharis*.

And now for an instance of decollation. On Barnes Common I have found *Bythinia tentaculata*, monst. *decollatum*, *Limnæa stagnalis*, monst. *decollatum*, and a decollated specimen of *L. palustris*.* The decollation is most marked in the *Bythinia*, and less so in the *Limnæa*. Now in the instance of these Barnes specimens, I think there cannot be much doubt that the truncated spire is caused by a want of calcareous material in the water, and that, if a number of them were introduced into a pond containing a sufficient amount of carbonate of lime, the next

* My brother (S.C.C.) has also taken the decollated form of *L. peregra* at Barnes.

generation would have perfect spires, the decollation not being transmitted.

White varieties would seem to be caused by the non-development of the colour-forming organ, but, again, as in the cases given above, white varieties are also local, being confined to one spot, or to one neighbourhood, and it is rarely that, one having been found, a careful search does not reveal others. That these white or colourless varieties are due to the nature of the food or of the soil is unlikely, because they are always, or nearly always, found with typical coloured specimens.

It cannot be due to a contagious disease of the colour-gland, as in that case we should find specimens which had commenced life with coloured shells, but having subsequently lost the colour-forming function, would have the last few whorls colourless; and I

Fig. 55.—*Helix lævipes*, var. *alba*. Calcutta. A normally sinistral Helix.

Fig. 56.—*Stenogyra decollata*. Marocco. An instance of normal decollation.

Fig. 57.—*Limnæa stagnalis*, monst. *scalariforme*. Chislehurst Common.

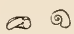


Fig. 58.—*Valvata piscinalis*, depressed variety. Crayford brick earth.

Fig. 59.—*Physa fontinalis*. A large specimen. Ealing.

Fig. 60.—*Physa acuta*. Kew Gardens.

have never seen or heard of such a specimen. Again, there are the colour varieties, also local in their distribution, and apparently, though of course not really, without cause. The bright colours of some varieties of *Helices*, such as *H. nemoralis*, seem even to be injurious, as they make the shells such conspicuous objects as they crawl, and enable the birds to find them readily; and that birds *do* eat numbers of these brilliantly coloured snails, is well testified by the heaps of broken shells round a suitable breaking-stone. But there is one instance, that of the green *H. nemoralis* at Crayford (see page 236), in which variation would appear to be protective, but it was a variation in the animal, and not in the shell, that caused the green tint.

And there are many other points which seem to me to need careful study before any conclusions can be arrived at, and I will give an instance: of what use are the bands to the helices? why are they developed? and why do they vary so much? All I can say is that I do not know why, but it would seem that form from which the now existing helices were developed had five definite bands, like *H. nemoralis;* or perhaps, we may go still farther back and say that the form from which all the Gasteropoda sprung, the first type of the Gasteropod shell-bearing Mollusc, was banded. The reason for this speculation is that the bands are always in the same relative position in the Gasteropoda when they are developed, the band just above the periphery being specially characteristic. However, this is a subject to which little attention seems to have been given, but I think that it will well repay research.

In the present paper I shall not deal with so huge a subject as the variation of the mollusca throughout the world; I leave this to others, and shall only describe the variation of the mollusca in the counties of Kent, Surrey, and Middlesex, the counties which I am now working.

GASTEROPODA.

Neritina fluviatilis.—This shell does not seem to vary much, and I have never taken an abnormal form. Nevertheless four varieties have been recorded as British.*

Paludina vivipara.—The bandless form (var. *efasciata*, = var. *unicolor*), has been recorded from Richmond, I have not taken it myself.

Bythinia tentaculata.—The colourless or white variety occurs in the district, and the varieties *ventricosa* and *excavata* are also recorded. Monst. *decollatum* I have found at Barnes.

B. Leachii.—Var. *elongata* is recorded for West Kent.

Valvata piscinalis.—I have taken a variety showing traces of bands; var. *subcylindrica*, a dead shell at Hammersmith. The type and a variety approaching var. *depressa* occur fossil at Crayford.

Planorbis lineatus, var. *albina* has been recorded for East Kent.

Planorbis nautileus.—This has two main forms, the so-called type and the var. *crista*. Both are found in the district.

Planorbis spirorbis.—A dead shell of var. *albida* at Bedford Park (D. B. Cockerell).

P. vortex.—At Fulham I have taken a variety of this species. (See p. 14.)

P. carinatus.—I have found the variety *disciformis* near Guildford.

P. complanatus.—Mr. J. W. Taylor describes the monst. *sinistrorsum* from a specimen found by Miss Hele at Wye. This instance of a sinistral monstrosity of *Planorbis* is, I believe, unique. The white variety is said to have been taken in West Kent, and also the var. *rhombea*.

P. corneus.—This species varies in size, the largest specimen I have found is from Ealing. The young

* Mr. R. A. Freeman has a specimen having a broad white band below the periphery which he found near Barnes.

shells are sometimes striated like *P. albus*. Some specimens collected at Minster have a reddish tinge. I have taken the white variety in Thanet, and also a single young specimen at Kew Gardens. The white var. has also been reported as occurring in Middlesex.

Physa hypnorum.—The mouth of this shell is sometimes tinged with pink.

Physa acuta.—This is not really a British shell, the only locality for it being one of the water-lily tanks in Kew Gardens, where it is abundant. One of my specimens has the bands 4 and 5 slightly developed.

Physa fontinalis.—This varies in size; my largest specimen I took at Ealing, with the large *P. corneus*, it is slightly more than $\frac{3}{8}$ of an inch in length. I have taken a single specimen of the white variety at Herne Bay, living with the type.

T. D. A. COCKERELL.

(*To be continued.*)

AN AQUARIUM IN A BOTTLE.

I HAVE kept small shore crabs (*Carcinus mænas*) in wide-mouthed glass pickle bottles for many months, and also hermit crabs (*Pagurus Bernhardi*), but the former do the best. Serpulæ (*Serpula triquetra*), and also very small terebellæ do well too, but I have never been able to keep full-grown mussels for more than a day or two. My plan is to fill the bottle one-third full of fine sand, and place on this a large stone with a piece or two of ulva growing on it. This stone is tilted up in such a way, that there is deep water (comparatively speaking), in the front of the bottle, while behind it is only just covered. When first made a strip of paper should be pasted on behind to mark the level of the water, and it should always be kept up to that level with a spoonful or so of fresh water, as needed, to make up for the loss by evaporation. The less water there is in the bottle, the better; it will be found quite sufficient to fill it half or two-thirds full (including the sand). The plan suggested by Mr. Lovett (vol. xx. p. 75) will be found a very good one by those who have not a cool place in which to stand the bottle in hot weather. If the water turns a little green, placing it in the shade a day or two, I find soon remedies it. If anything goes wrong, and the water turns black, I pour it into a clear glass bottle, put a few pieces of confervæ in, and place it in the sunshine; the oxygen produced by the influence of the sunlight on the seaweed soon neutralizes the offensive gases produced by putrefaction, and in a short time the water is as clear as ever. I do not shake the water, but let it remain constantly still; shaking it retards the purifying process. Although I use bottles when I have so many creatures, such as crabs, requiring isolation that I scarcely know what to do with them, I do not recommend the plan, except as subsidiary to other aquaria. A propagating glass can be bought for a few pence, and this inverted and placed on a suitable stand will be found by far the best. Stocked with anemones, serpulæ, terebellæ, a young nereis, periwinkles, very small mussels, and a few acorn barnacles with, perhaps, one or two small prawns, it will be a constant fund of amusement and instruction. A few pieces of green seaweed will make it look very effective, but care must be taken not to introduce too much, or it will decay, and blacken the water. Fish and crabs require vases to themselves, as they will neither agree with the other inmates nor among themselves.

ALBERT WATERS, B.A.

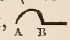
Cambridge.

A NET FOR MICROSCOPISTS.

AS the bright days increase in number, every one is led involuntarily to look over his collecting apparatus in anticipation of that sudden starting into renewed life of all aquatic vegetation, and the consequent crowds of Infusoria, Entomostraca, &c., which afford all those who are keenly interested in their birth and "education," such an endless amount of pleasant recreation. The pleasure of such collecting, I always think, is greatly increased by the use of a convenient net, which should enable one to remove any object of value, and recommence the netting without unnecessary loss of time.

The methods usually adopted for attaining this, are, either to wash the muslin in a wide-mouthed jar, which must therefore be carried out on all expeditions, or to use a set of muslins, each one of which when sufficiently covered with life, is removed and dropped into a bottle, of necessity, large and cumbersome.

I tried the simpler of these two modes, *i.e.* washing, for some time, but never found that the result was altogether satisfactory, many specimens of worth being washed out of the net, if its passage through the water happened to be in the least degree hurried.

The next that I tried was a deep conical net, stretched upon a framework of cane, bent (after boiling) somewhat to the shape of an iron hook, 

Across the semicircular portion, *i.e.* from A to B, I stretched a copper wire, not less than six inches in length, which served as a finer cutwater than the cane, and made a strong and effectual "scraper" for such stems as those of the water lily. I had, from the first, considerable difficulty in turning a net of this shape inside out, and, to overcome this, at length contrived one, whose construction I hope the following explanations will render sufficiently clear to enable those who may care to copy it to possess one similar to my own. The framework is precisely the same as that shown above. The muslin bag is so arranged that the point of the cone comes exactly opposite to

the centre of its mouth when stretched out behind it, and within this point is inserted a half-inch test-tube having the bottom ground off. The ends of the muslin for the space of half an inch are bound tightly round the head of the tube ; the projecting rim of the glass preventing it from being pulled out. Round the whipping is placed a broad band of cork—a wine cork with the centre burnt out, and the edges bevelled forward, to prevent undue resistance to the water, which keeps the tube always behind the muslin, and ready to receive the contents of the net ; otherwise, when the net is moving very slowly in the water, the tendency of the tube is to sink below the mouth, thereby causing all animal life to be merely washed in and out again. The tube is closed by placing a square of muslin over the open end, and securing it with a very small band of india-rubber. It is worth remembering that duplicates of both muslin square and elastic band are indispensable, these being the two most important parts of all.

Care should be taken when cutting the muslin that the piece coming from the wire be quite flat and remain so after being fixed in its place, for if there is any looseness near the wire, thereby forming a small hollow below the level of the tube head, solid matter, instead of flowing at once into the tube, will "hang" in this hollow. When it is required to remove the contents of the net to the collecting bottle, proceed thus.

After a favourable spot has been thoroughly fished, the net should be drawn in to the bank, raised from the water as rapidly as possible, and the thumb of the right hand pressed tightly against the bottom of the tube, so that it may be kept full of water. All that is within may then be readily examined, by holding the glass against the light, when organisms of any size are at once discerned, and the small diameter of the tube does not prevent the use of a pocket lens, which is practically useless when the objects are procured in the dipping bottle. If the tube contains anything of value, the thumb of the left hand should be placed upon the head of the glass, which should then be turned upside down, the square and band removed, and the water gently poured into a medicine bottle, this being a shape of vessel admirably adapted for carriage in a pocket. In constructing this net, it is advisable so to arrange the muslin, that when travelling in the water the wire may precede the cane, for, when skimming, if the shadow of the framework is allowed to pass over the life collected on the surface before the wire with the net attached is able to follow it up, it is more than likely that many specimens will make good their escape. After using this net for a few minutes, I have always found more in the glass tube than others have been able to collect in as many hours, while using the favourite bottle and stick ; and it is worth remembering that each plunge of the dipping bottle adds seldom less than half-a-pint of water to the total amount that must be carried, perhaps for miles, while the net and tube increases the amount by never more than one table-spoonful. Indeed, I have frequently returned from half-an-hour's collecting with enough in my medicine bottle to occupy me for many evenings, and to completely colonise a two gallon globe. I generally cut a stick from the nearest thicket, to lengthen the handle, which gives one a wider field for netting, the size of which, naturally, is in proportion to the length of stick obtained. The whole construction of this net is so simple that from the boiling of the cane to the first trial in the water-butt, occupied me for little more than an hour, and, to adopt the language of advertisements, "since that time I have used no other."

Should these explanations not be sufficiently clear to enable those who are desirous of copying my design to do so to their own satisfaction, I shall be very pleased to forward more exact dimensions, and a paper pattern of my own net to any who may apply for it.

HERBERT ALEXANDER WALTERS.
The Hermitage, Reigate.

STUDIES OF COMMON PLANTS.

[*Continued from p.* 62.]

No. II.—THE CUCKOO-PINT (*Arum maculatum*) (*continued*).

By CHARLES F. W. T. WILLIAMS, B.A. Cantab.

THE next disease to be noted is one which frequently causes mistake and annoyance to the ardent searcher after micro-fungi. I mean a decomposition of internal cell structure, extending over but a small area, and clearly apparent to the naked eye in the form of dirty brown or light spots. Again and again beginners, and others, who I presume lay claim to being something more, send me leaves of the arum thus marked, in the fond belief that they have found the somewhat uncommon *Œcidium ari*, in large quantities ! Only the other day, I heard of the case of a gentleman who devoted much time and trouble to the examination of such leaves, but in the end confessed to the lady who had brought him the *valuable* specimens that "he could see nothing." It may be well then to bear in mind that there are two forms of disease which should be distinctly separated from one another in the mind and the eye of the enthusiastic collector. And this brings me to speak of the actual attack of the fungus known as *Œcidium ari*.

In the first place, as I have mentioned, *Œcidium ari* is not common. The leaves on which it appears are not always marked on the upper side, and, as is so often the case, are more frequently healthy in appearance than the reverse. In general, however, there is some slight indication on the upper surface of the

lamina of mischief below. On turning the leaf over, round orange-coloured spots will be observed scattered over the leaf, and in some cases affecting the petiole. The central peridia are abortive. Most of these points can easily be distinguished with the naked eye.

Dr. Cooke's description is as follows: *Œcidium ari*, Berk.; wake-robin cluster cups; spots round, confluent; peridia circinative, not crowded, central ones abortive.

The whole plant seems to exist very comfortably even when severely affected with this fungus. Many of the unhealthy plants of arum I have examined this season have been entirely free from the Œcidium, though in company with numbers affected. The plants in this part of the country are only locally affected, one locality only furnishing specimens.

It is now time, I think, to pass on to the contemplation of that interesting and curious structure, the spadix. The spadix of the arum, commonly known as "the flower," is well calculated to puzzle the novice at botanical description. The spadix is enclosed in a green spathe, considerably longer than the spadix. This spathe, on opening, is sometimes found to be spotted in the same manner as the leaves, only the colour is brighter, and the spots have the appearance of being raised above the surrounding tissue. It does not follow that the plants whose leaves are spotted have their spathes spotted also. The spadix terminates in a naked cylindric column contracted below the middle. The colour of the column is dull purple, or sometimes yellow; rarely white. The shades of purple vary somewhat, but it is not common to find the yellow and white varieties, though I have done so several times this season.

The column has a very velvety appearance and is beautifully smooth to the touch. On examination it will be found to be covered externally with minute papillæ, secreting colouring matter (Fig. 61). These are very minute, and the best way to view them is to take a very thin section of the column and view with a $\frac{1}{4}$ or $\frac{1}{8}$. The column is of cellular structure with every cell so closely packed with starch grains that, as in the corm, it is very difficult to discern the tissue of which it is composed, except in the centre through which run cells with numerous air cavities; raphides can also be seen. I have noticed this year a curious disease of the column which may possibly be common enough, only it has never before come under my notice. In numbers of cases on the spathe opening, I have discovered the terminative column of the spadix covered with a mould. In some instances the column presented a miserable shrivelled appearance, while in other cases perfect size was gained. In very few cases did the diseased column affect the organs of reproduction. Many of the plants noted by me as so affected are now in fruit. The column showed very plain signs of disease throughout its structure. If picked and brought home the spadix so diseased gradually reached a gelatinous consistency, and emitted a most offensive odour. It would be interesting to have the work of some authority, on the subject of this mould. Unfortunately, the time is so short between the opening of the spathe and the fall of the column that almost hourly attention would have to be given to the matter.

Leaving the column and descending the spadix, we come first of all to a ring of organs which in reality are aborted stamens or staminodes; next to these are a crowd of sessile anthers. The pollen possesses no special feature in markings or shape. Below the anthers are a ring of rudimentary ovaries, and lastly a crowd of naked sessile ovaries. Fig. 62 shows the

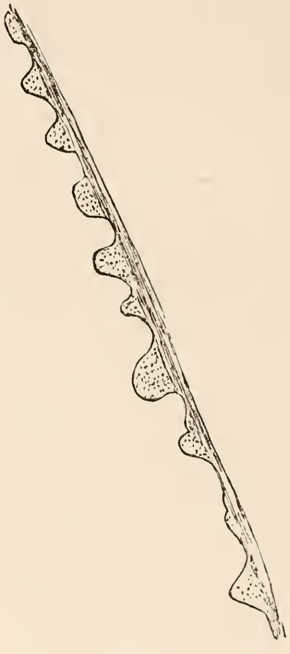


Fig. 61.—Papillæ from the column of the Spadix. (Mag.)

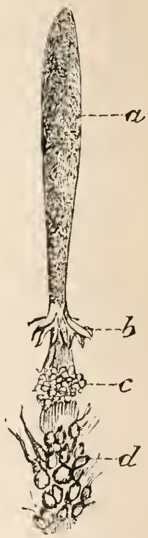


Fig. 62. — Spadix with the spathe removed. *a*, extremity of the spadix; *b*, staminodia; *c*, sessile anthers; *d*, naked sessile ovaries.

spadix with the spathe removed, with the various organs I have mentioned. The fruit of *A. maculatum* is a berry, a large quantity being clustered together, bursting the base of the spathe, which is persistent. When ripe the berry becomes red, and should be most carefully avoided by all persons having a tendency to taste luscious-looking berries, or the result of the repast may be alarming, if not serious. Should a child be unfortunate enough to eat any of these berries, an emetic should be given, and the mouth should be carefully cleansed from all particles of berries remaining there.

There is one curious property connected with this plant, which it would be very negligent not to mention. I mean the power of evolving heat possessed by the spadix on its first opening. I had hoped to give a

table of my own experiments on this subject; but though I tried time after time to take a reading, I regret to say I failed. Either I was on the spot too early or too late, and I have really nothing, for this season, at any rate, of a reliable nature to record on my own account. I must content myself, therefore, by giving a quotation on the subject from the late Professor Balfour's Class Book of Botany, p. 522. After remarking on the evolution of heat during flowering, and the fact that the natural order Aroideæ present the most marked instances of this evolution, the Professor says, "Deubrocket's examination of the spadix of *Arum maculatum* gives the following results:—

Date and Hour.	Deviation of Thermo-electric Needle.	Heat of Spadix above Air.	Temperature of Air.
P.M.	°	° F.	° F.
May 2nd, 4	64	17·6	59·9
„ 5·30	65	18·7	60·2
„ 6·30	58	12·5	60·2
„ 7	55	10·6	60·0
„ 8	44	6·3	59·5
„ 9	30	3·4	59·0
„ 10	19	2·1	58·6

From these observations, it appears that the maximum of temperature in the spadix occurred at 5.30 P.M., one hour and a half after the complete opening of the spathe, and that the heat was 18·7° above that of the surrounding air." The spadix emits a curious odour, resembling that of the thyrse of the horse chestnut.

As with the corm so with the fruit, starch and raphides are found in every section examined. Professor Gulliver, in his paper on "Plant Crystals," (SCIENCE-GOSSIP, p. 97, 1873) mentions the occurrence of raphides in the berry of *A. maculatum*, and on page 98 gives a figure of the same. The raphides of the berry appear to be larger than those of other parts of the plant. Many months will have to pass before again an opportunity is given of observing in all its various details this interesting plant; but when that time arrives, there will yet be found much material for examination, and a field for interesting research, and perchance new discoveries.

Bath.

MR. G. C. WALKER, F.R.C.S., writing to the "Lancet," says that after he had operated for cataract upon a favourite fox-terrier belonging to a friend, chloroform having been used, the animal appeared after the operation to be completely dead, none of the remedies tried producing any good effect. At length it occurred to him to employ artificial respiration and nitrite of amyl simultaneously, instead of separately as he had already done. The result was that "two or three compulsory breathings of the amyl caused the dog to jump up and stagger about the room most actively." Since that time Mr. Walker makes it a rule not to administer chloroform without having nitrite of amyl at hand.

MY GARDEN PETS.

By E. H. ROBERTSON.

PART I.

"YOU are so fond of dumb creatures, have you no other pets?" was one day the enquiry of a friend, who, from my dining-room window, had been long admiring my trustful window pets.

"Many," I replied; "follow me, and you shall see them."

I led him, all expectation, into my garden, where, at a few paces from the house, stood a row of bee-hives, and smilingly was about to remark that there were a few thousands, but was arrested by his disappointed exclamation, "Oh, bees!" "This does not augur well for his interest in my pets," thought I, and the added assertion, "But you can't make pets of them—they can't be tamed—such little things can't possibly know you," drew from me the reply, "Indeed! I not only can, but do, make pets of them, and they certainly know me as well as, perhaps better than, the birds do."

Although politeness kept him silent, the look of incredulity with which he regarded me told me plainly what he thought.

"Are you afraid of bees?" I asked. His stammered out "N-no. Oh, n-no," as, after turning up the collar of his coat, and down the brim of his felt hat, he plunged his hands into the depths of his trousers pockets, and fell into the rear, led me, however, to think that it would be wise to protect him from possible attack.

The alacrity with which he retreated into the house when I suggested that he should be veiled and gloved did just a little amuse me, I must confess, and when I add that, although my dear friend is the author of works treating largely upon bees and ants, he yet does not really know the difference between the largest *Bombus* and an ordinary honey bee, I think my readers, also, will give free scope to their sense of the ludicrous. Be-veiled, be-gloved, and closely buttoned up, my bee-literary friend was again brought forth, to be led to a spot where stood my four strongest stocks. It was a lovely summer day, and, honey being abundant, my pets were, in their thousands, pouring in and out.

"Aren't you afraid of their stinging you?" asked my friend tremblingly, as, standing a little on one side of a hive, so as to allow homing bees to enter, I placed my bare hand upon the alighting board. I made no reply, and as the in and out-flowing streams passed over my hand and I yet remained unhurt, he saw that his question was unnecessary. Presently, "Dear me, how very singular—most remarkable. Evidently look upon you as a personal friend."

"Well, so I am."

After a moment's silence, he enquired, "Now, could *I* do that?"

My answer did not encourage him to try the experiment. "Certainly, if you wish, but they will possibly, nay, probably, sting you."

"But tell me—if you can do it, why can't I—why can't any or everybody else?"

It is possible that, with my friend, many readers, who may also be bee-keepers, would like to know my secret; know how they may pass unscathed through an army of bees; may introduce an ungloved hand into the midst of a thickly peopled hive—in fact, may manipulate with the tiny creatures as though they were but bits of cork or feathers. Let me at once assure such that, although quite unprotected, I move and operate amongst my petted host, I yet possess no secret charm; that my skill is no greater than that of a large number of bee masters. Rigidly observe but two rules, and success in manipulating with bees is, with few exceptions, assured. They may be made as much pets of as dogs or birds. The first is, ever to deal as gently as possible with them. Never jar, jolt, shake, or otherwise disturb or irritate them. The second is, make them become as familiar as possible with your person.

In dealing with them it is essential that it should ever be borne in mind that, although they have many enemies, they have but one weapon of defence, their sting; which is never used, as the bee believes, unnecessarily—its effectual use meaning certain death to the devoted possessor. Some persons assert that, if a bee be not disturbed, he will withdraw his sting without injury to himself. I can as confidently assert that he cannot.

Show that you are not a foe, but a friend, and you need never fear being stung, that is to say, not *intentionally*. I use this word advisedly, because, the slightest pressure on the creature's abdomen is sufficient to project its weapon, and should the inside of a sleeve or collar be selected as a snug retreat, the almost certain result will be the tiny puncture which the timid so much dread.

"It's all very well," some novice may exclaim, "it's all very well saying show yourself to be a friend, but how am I to do this? When I approach my bees too closely I am invariably beset."

Let me say that all depends upon the way in which each individual beekeeper's approaches towards friendship are made.

When I commenced bee-keeping, some few years since, I had but two stocks; I have now fifty; and being, of course, as all novices are in any new pursuit, enthusiastic, it was my chief delight to seat myself upon the hive bench between the hives, to watch the proceedings of the busy little workers. To familiarise them with my person, I frequently gently placed a hand upon an alighting board, and although it might sometimes be covered with bees, I never withdrew it on that account, and finding, after careful examination, that no danger was to be apprehended, they would re-enter the hive. In no instance was I stung. To the present day, I occasionally, too, adopt the following plan. However seemingly indifferent to the presence of a stranger, or foreign body, they may be when the work of the hive is in full swing, and the light of day reveals that presence, it is quite a different matter when the object can be but imperfectly seen in the dusk of evening. Disturb a hive then, and instantly the contented hum of the fanners is hushed, and not one, nor two, but many brave defenders of the hive issue forth, to discover the cause of the disturbance; sometimes scores, nay, in hot weather even hundreds rush out, and should it be the bee-keeper's hand placed before the mouth of the hive it will be instantly covered with bees, eager to inspect every part of it, and, if possible, learn its nature. The arm, both outside and inside the coat sleeve, will be ascended, and a few more inquisitive than their fellows will probably cross the shoulders, and descending the disengaged arm will, if it be placed upon the hive, return to their home by this route. It requires some little moral courage to remain immovable whilst the alert insects thus perambulate one's person. Some short time since, I was kept a prisoner for upwards of twenty minutes before the last of my pets took his departure.

I must here plead guilty to a practice much deprecated by many bee-keepers, nor have I found that any evil result has followed. Of course I exercise a reasonable amount of judgment as to time, place, &c., having far too great a regard for my pets to imperil their safety simply for the gratification of a whim. I allude to occasional open-air feeding—to me a source of pleasure—to my friends of wonderment. Always choosing a warm spring or summer day, I select a sunny spot in my garden or orchard, some distance removed from my hives, and place on the ground an open pan or dish filled with syrup, upon the surface of which float strips of perforated wood or cork, to prevent danger to the bees. Not long have I to wait, for in and near an apiary they are ever skimming the surface of the ground, and visiting plant and flower in search of honey and pollen. Sometimes immediately, occasionally after the lapse of two or three minutes, a sharp-scented bee alights, and after taking his fill of the luscious feast, flies home. Meanwhile, probably, two or three others have also been gathering a supply; whether or not, the first will certainly soon return, quickly followed by some of his brethren. Half-a-dozen soon becomes a score, these soon increase to hundreds, until, as the news spreads, the air becomes filled with bees, all bound to or from, or in search of, the store. Should the supply be a long continued one, there is no limit to the vast horde, and when at last it becomes exhausted, the vessel is found to contain a seething mass of black bodies and glittering wings,

mingled with slips of wood and cork tossing upon a troubled living sea. Thrust, without injury to the bees, a hand into their midst, and though ten thousand should be present, not a sting will be received; sharply tap the pan and a thick cloud will arise; carry it away but a few feet, the insects will follow, and so eagerly intent are they upon gaining the treasure that, regardless of all else, they immediately again settle. When holding the pan in my hand, so thickly have I sometimes been enveloped by the cloud of eager honey-seekers, that timid onlookers have often declared that I have been almost obscured by them. Realising at last that the supply has stopped, the army gradually disperses, the loud hum ceases, and the business of the apiary proceeds as usual. Not a few patient gatherers most persistently hover about the spot until darkness falls; many will most certainly return to-morrow, and each succeeding day, and, should the syrup have been often administered in the same place, all through the summer my pets will be ever seeking for a fresh supply, and when seated on my lawn I am usually attended by a goodly company of my satellites. If I were, however, to bestow my sweet gifts with too bountiful a hand, my whole apiary would soon be in a fierce commotion, and my pets would become so demoralised that serious mischief might result. As it is, I carefully watch, to discover if robbing is likely to take place. Should I find that robbers are striving to effect an entrance into any particular hive, I immediately narrow the entrance, and a liberal administration of carbolic acid and water puts an effectual stopper upon their plundering proclivities.

I never indulge in the amusement, except in suitable weather, and would here warn bee-keepers who may be tempted to try the experiment, not to entice the little fellows from their snug homes when—although the sun may be shining—the wind may be cold, or the result will assuredly be the opposite to that desired. There are few living creatures so susceptible to changes in temperature as the great family of the Hymenoptera. The amount of labour performed by them is, to a considerable extent, determined by the degree of heat, and the hygrometric condition of the atmosphere. It appears, however, to be not so much the prevailing temperature as the *fluctuation* which most affects them—sudden falls being particularly obnoxious to them. For example at, say, 50°, my pets are quiescent—but let a sudden rise to 70° take place, and all is life and activity. The delighted insects issue from the hives in their thousands to gyrate and rise and fall in the welcome sunshine, repeating on the following day their merry dance; finally, if the weather remain propitious, scattering to every point of the compass in search of provender. Should the temperature continue to rise, as it almost invariably does, for about a fortnight, in March, each returning day brings with it renewed activity, till the air becomes resonant with their cheerful hum.

But suddenly all is changed—dense clouds obscure the sun—the wind is chill, for as quickly as the temperature rose from 50° to 70°, and thence up to 90° or 100°, it once more falls to 70°—the heat which so delighted them but perhaps one short week before—yet now all is still, not a bee ventures beyond the door of his home, and the merry active little rascals of yesterday are to-day sluggish and inactive. 'Tis the suddenness of the alternation that has wrought this change, and when the sensitive little fellow gets accustomed to the lower temperature, he will once more set to work.

(*To be continued.*)

THE ANEMONES OF THE ALPS.

By C. Parkinson, F.G.S.

Very soon after the snows and frosts have disappeared from the lower valleys of the Alps, and the sun gains power in the lengthening days of early spring, the brilliant anemones of the Alps burst into flower, throwing such colour into the woodland and hillside scenery, as only Swiss flowers can do. In February, we may commence to search in sheltered copses for the delicate hepatica (which Swiss botanists include in the genus Anemone). From a warm layer of moist, leafy mould, the strong shoots of the Hepatica put forth, surrounded by the dull, brownish-green, trilobed leaves of the previous year, which remain hardy throughout winter. The tiny shoot is protected by a silvery white covering, from which the blue, pink, or white sepals are quickly drawn out on a slender stem by a few days of sunshine. Later on, a profusion of fresh green leaves are produced, and the woods are brilliant with colour.

It is worthy of notice that the common hyacinth of English woods is not known in the Swiss flora, and the hepatica (*Anemone triloba*) certainly takes its place. Very early in March, and abounding in woods with the hepatica, the graceful little wood anemone (*A. nemorosa*), is as plentiful as in English woods. A fortnight later, or perhaps early in April, the *Anemone ranunculoides* covers the moist meadows with golden flowers. The roots of this species spread in light, damp soils in a wonderful manner; creeping around, and putting up fresh shoots in all directions. The sepals are usually five, and less pointed than the yellow anemone. We recollect, as figured in Sowerby's "English Botany," the flowers are mostly solitary, but sometimes two or three on a single stem, the deeply cut leaves branching from the same stem.

In March also we may look on grassy ledges, higher up among the mountain paths, for the deep violet-coloured *Anemone montana*, which braves the early winds of spring. It is essentially a robust

plant, covered with a thick down of silvery hairs, which lend a peculiar beauty to this, and several kindred species. The carpels also, are very handsome with their long hairs and silver down. The plant attains considerable height, and specimens we have gathered have measured from 12–16 inches. It is much larger in growth than an English pasque flower (*Anemone pulsatilla*), which we may also look for in Switzerland on the borders of woods; it is, however, of humble growth, averaging a few inches in height, and having the sepal reversed at the tip. Less common, and at a greater altitude *Anemone Halleri* (DC.) is found, having lilac sepals; standing erect, and more hoary-looking than *A. montana*, which, however, it resembles. Any of the three last species may occasionally be found with white sepals.

A. vernalis is a lovely plant. We have found it in April and May some 3000 feet above the sea. The leaves are all radical, the whole plant is hairy, with an involucre of linear, downy segments immediately beneath the white sepals which are exquisitely shaded on the back. The narcissus-like anemone is plentiful on grassy slopes from 2000 to 3000 feet above the sea, flowering in May. The large Alpine anemone and its sulphur-coloured variety may be found in May and June on the Simplon in great beauty; indeed the fields covered with *A. sulphurea*, near the village of Simplon are worth the expedition up the pass to see.

Anemone Baldensis is a small species, having a single longish stem, and white flower of 7-8 sepals, and delicately cut leaves chiefly radical, but leaflets clasping the stem.

In order to clearly express the different species, we give the following classification.

Fig. 63.—*Anemone pulsatilla*, L.

Fig. 64.—*Anemone montana*, Hoppe.

GENUS ANEMONE (L.).

Sepals 5–10, coloured; petals, none; stamens, numerous; carpels, 1-seeded; usually an involucrum of cut leaves.

a. Leaves radical, stem furnished with involucrum, carpels plumed.

1. *A. alpina* (L.). Involucrum leaf-like; short pedicel; large flower; solitary, white sepals; plant hairy; leaves deeply cut and divided.

2. *A. sulphurea* (L.). Regarded by many botanists as a variety of *A. alpina*; plant hoary, and covered with white hairs; sepals sulphur colour; involucrum slighter than the previous one, but also tripartite.

3. *A. vernalis* (L.). A beautiful plant covered with hairs; involucrum close below the single flower,

consisting of narrow segments; sepals mostly white, dove coloured, or silvery at the back.

4. *A. pulsatilla* (pasque flower). Plant some six inches high; silvery down over leaves, stem and back of sepals, carpels feathery, sepals violet pointed, bell shaped, and hardly curved back at the points; involucrum of linear downy leaflets; leaves small, delicately cut, and few in number. (We believe this is figured in Weber's "Alpine Flora," vol. i. as *A. Halleri.*)

involucrum of 3, 5 divisions; leaves 3 divided and subdivided (a variety occurs with one flower, *A. monanthos*).

8. *A. ranunculoides* (L.). Sepals yellow; 1–3 flowers on a stem; involucrum leaf-like; carpels pointed.

9. *A. Baldensis* (L.). Single flower; white oval sepals 6–9; leaflets of involucrum twice ternate, leaves the same.

10. *A. sylvestris* (L.). Single flower, large white sepals; leaves 5-partite; unequally serrated.

Fig. 65.—*Anemone Halleri.* (After plate in Bennett's "Alpine Plants," vol. i.)

5. *A. montana* (Hoppe). Plant much larger than *A. pulsatilla*, of similar growth; sepals more turned back, growing 12–16 inches high; leaves cleaner cut, spreading; flowers bend down in a remarkable manner, and colour is deeper than that of the pasque flower.

6. *A. Halleri* (DC.). Sepals lilac, about six in number, spreading, not so downy on the back; prominent involucrum of broader dark green segments. A strong plant, with thick stem and few leaves (beautifully figured in Bennett's "Alpine Plants," vol. i.).

β. Carpels not plumed, involucre sessile.

7. *A. narcissiflora* (L.). Several white flowers in a terminal cluster or umbel; carpels glabrous;

11. *A. nemorosa* (wood anemone). Identical with our English wind flower.

12. *A. hepatica* (*Hepatica triloba*). Involucrum of 3 entire calyx-like divisions; sepals blue, white or pink; leaves boldly tribobed; each part entire; carpels pointed.

Of *A. hortensis* (L.), with rose-coloured terminal flower, 10–12 sepals, given by Mortier, in "Flore Analytique de la Suisse," as a doubtful plant near Montreux we can find nothing.

The Physical and Chemical Laboratories of University College, Bangor, were opened by Sir William Thomson on February 12. A description, with plans of them, may be found in "Nature" for February 26.

NOTES ON NAIADES.

In number 239, p. 261, Mr. W. Gain records the taking of some large examples of *Unio pictorum*, $4\frac{13}{16}$ in. long (I take the length as from umbo to front margin, analogous to the apex and lip of a gasteropod, not as taken by Mr. Gain) and asks whether that size has been exceeded. I can answer him in the affirmative. I have in my cabinet some *Unio pictorum*, the dimensions and weight (Avoir.) of some of them being as given below.

in.		in.		oz.
$2\frac{1}{16}$	×	5	=	$2\frac{3}{4}$ over.
$2\frac{1}{16}$	×	5	=	4 nearly.
2	×	$5\frac{1}{16}$	=	$3\frac{1}{2}$ over.
$2\frac{3}{16}$	×	$5\frac{1}{4}$	=	$3\frac{1}{4}$
$2\frac{3}{16}$	×	$5\frac{1}{4}$	=	$3\frac{3}{4}$ over.

These are careful, fair measurements, the weight not being given exact in every case, as will be seen.

The shells are clean and beautifully grown, with little erosion even on the umbones, and, so far as my knowledge goes, they are the finest of their kind ever seen. The following are *Unio tumidus*.

in.		in.		oz.
$2\frac{3}{8}$	×	$4\frac{3}{8}$	=	$5\frac{1}{4}$
$2\frac{5}{16}$	×	$4\frac{3}{4}$	=	$5\frac{3}{4}$ nearly.
$2\frac{3}{8}$	×	$4\frac{7}{8}$	=	5 over.
$2\frac{1}{4}$	×	5	=	$5\frac{3}{4}$ nearly.

Both the species occur in a pool near Birmingham, which may fairly be called dirty, having the muddiest basin I ever saw, with abundance of decaying vegetable matter.

I think I may answer for the accuracy of Mr. Gain's identification of the species, which is also confirmed by Mr. J. W. Taylor ("Jour. of Conchology," No. 4, vol. vii. p. 224). This, for the satisfaction of Mr. E. Harmer (Science-Gossip, No. 240, p. 280).

In order to make this a little record of giant Naiades let me note the following :—

In Science-Gossip, No. 43, p. 160, Mr. W. Hambrough records two fine shells of *Anodonta cygnea*, taken at Worthing, of the following dimensions.

$7\frac{1}{2}$ in. × $4\frac{1}{2}$ in. and 8 in. × 5 in.

(The shells are measured as Mr. Gain's—the longest way being taken as the "length.")

No. 125, p. 118, Mr. A. W. Langdon, of Hastings, gives the size of a Southampton shell of this species as $7\frac{1}{2}$ inches wide.

No. 126, p. 136, Mr. Sclater crowns all, by recording two of the largest shells of which I have heard, one being $8\frac{1}{4}$ inches wide, the other over 9 inches wide, both from the river Dart. It would be interesting to know whether these fine shells are still in existence, and to have their portraits.

No. 129, p. 212, Mr. W. Budden gives 7 inches as the width of a shell in his possession taken near Ipswich. The largest shells I have from this neighbourhood are $6\frac{1}{2}$ in. wide. All the widest shells among the Unionidæ I have seen have occurred in pools, the placid and even conditions of their life enabling them to increase the size of their shell, while in rivers and streams they rather increase it in strength, the usually rough pebbly or coarse sandy bed in which they live, being inimical to their expansive growth. I have a grand shell of the variety incrassata (*A. cygnea*) sent to me some years ago by Dr. Buchanan White, which weighs 7 oz., an extraordinary weight for this species ; an average shell of the same superficial measure would weigh under $\frac{1}{2}$ oz. Like *Unio margaritifer*, with which it dwelt in the river Earn, it had to construct a house which would withstand the knocking of stones, and it has successfully done it, coming out of the conflict scathless—here is beautiful adaptation. I have much to say about my old friends the Naiades, which I hope to have an opportunity of saying "some day."

I am pleased to see the growing interest taken in conchology as evidenced by the frequent notes in your columns. I remember the time when they were few and far between.

G. Sherriff Tye.

Handsworth, near Birmingham.

JAPAN WHITE, OUR WHITE BUTTERFLIES IN JAPAN.

By the Author of "Insect Variety."

I see from my window a white butterfly fluttering and settling on the cabbage beds. She scents each leaf over with a quick electric touch from the knobs of her antennæ, and when she is persuaded she is right, the extremity of her body is depressed with a spasm, and a melon-shaped egg remains glued to the spot. Once upon a time the white butterflies had only the wild cruciform flowers to resort to, and it is evident that the increase of cabbage culture has multiplied their numbers in Europe, for in northern Spain they are not nearly so abundant in the fields as the Bath whites, nor in Italy are they as common as the black veined, and in these countries cabbages do not in the same degree populate the wilderness. The green vein, on the other hand, has no sense for the alien vegetation of the garden, and is still a wild butterfly. To purloin her eggs you must go down to the inky pool mantled over with water-cresses, and watch there until a vagrant piece of white calico comes dabbling in the mire, or you must track her whims on the chalk cliff where the scentless mignonette shoots rank. She is yet wild as the wolves, and has none of the cat and poodle nature of your cabbage whites.

I have reared both the small white, and the green vein from the egg. Until they attain the length of seven lines there is little to discriminate the two

caterpillars, save that that of the small white is the greater coward, for stretching its prolegs backwards you will frequently observe it reposing flat on the cabbage leaf, while that of the green vein walks with head erect contemplating the sky. After this stage, the caterpillar of the small white commonly acquires some orange in the clear line along its back, and an orange speck on and behind its spiracles. In this country the small white butterfly is white or pale buff, and the yellow on the under-side is buff or canary yellow; it has also its pale spring and darker summer brood, differing in the amount of black marking which needs the midsummer sun for its full development. Perhaps the buff coloured variety, which is not the result of any especial food, is commoner in spring. The green vein varies in precisely the same manner; but I have never noticed the under-surface of the hinder wings buff in this country. In Lombardy, where we meet with larger races of butterflies, the green vein may be found with a buff under-surface to the hinder wings; and this form so nearly approaches the small whites of southern Europe, that no disciple of Linnæus could with any confidence say to what species a white butterfly from that portion of the globe should be referred.

But to trace the ancestry of the white butterflies, I would as soon go east as south. On reading the Entomologist's Monthly Magazine, for September, 1883, my eye was caught by a paragraph by Mr. H. Pryer stating that he had bred from eggs laid by *P. napi* many specimens of a summer brood that proved to be the *P. Melete*, hitherto considered a distinct species of butterfly. I wrote to Mr. Pryer in Japan, and he had the kindness to forward me, through Mr. Janson, quite a series of Japan whites, the oriental races of our small white and green vein. But, as I said before, the butterflies and moths we knew in our school days are giants when we see them come from Japan. The climate of the south of Europe adds a good quarter of an inch to the wing expanse of the green vein, which becomes three-quarters of an inch when we arrive at Japan, and these larger forms have the same buff colour on the under-surface of the hinder wings. In Japan, as in England, the spring variety (Megamera) is more or less immaculate above, and beneath the hinder wings the veins are strongly chalked; while the summer variety (Melete) is a counterpart of our dusky summer form: SCIENCE-GOSSIP, for 1883, p. 221, *d*). The spring variety appears from March to April, the summer variety from May to August. (See Mr. Pryer's paper. Trans. Ent. Soc. Lond. 1882, p. 48.) In England the dark *female* green veins appear in May and June, and I fancy they result from a retardation in the development of the butterfly in the chrysalis stage, and a consequent greater exposure to the photographic action of light. With regard to the small white butterfly in Japan (var. crucivora), the female is a little dark, as it is sometimes with us in summer (but perhaps there is also a spring variety), it is a trifle larger, but does not differ in marking from those of our own cabbage beds; *it is* a swarthy race. The big cabbage white, which I believe every physiologist will recognise in India, despite an idea to rebaptise it, has been thought likewise to extend to Japan (Proc. Zool. Soc. 15 Nov. 1881), but Mr. Pryer has not noticed it there.

Now, somewhat for microscopists, who will find in insect physiology plenty of wonderful research. Let any one hold a white butterfly from Japan to the light, and a play of yellow radiance kindles on the wings like the glare of a lamp, or the hue that falls on Alpine snow at sunset. This tincture of a warmer sky, peculiar to white butterflies in the east, is owing to the scales lying in even rows on the wings so as to throw alternate, distinct lines of reflection; whereas on the wings of our ill-fledged kinds, light grows as confused as it does on ground glass and sea foam. Nor can I doubt but that these muslin wings, shimmering with golden tinsel, are the delight of ardent eyes, on the sunburnt meadows of Japan, just as the little striations along the plumes of a male purple emperor bathe the forest gloom in lovely blue light that blinds the diamond insect eye with all the fascination of the prism. To produce these beautiful colours all that is required is a smooth evenly striated surface. My bookbinder has bound my last volumes of SCIENCE-GOSSIP in a lively blue that retains its gloss, the surface of the cover being covered with minute beading. When I hold the cover away from the light it is blue, when I place it against the light it is orange. Seen nearer, the little beads have their shady side blue, and their bright side orange, a matter which fairly puzzled an old writer in the "Insecten Belustigung," who appears to have supposed that the notches along the scales of the purple emperors had their two surfaces differently coloured. But any object that absorbs blue rays, as a white butterfly with a tinge of blue, or a butterfly, more intensely blue, must, if it be a good reflector, reflect the complementary colour, and an orange butterfly the reverse. Some call the natural colour chemical, and the other the dioptric; if so the white butterflies in Japan have a dioptric light. Could we not apply the matter to increase the light of our lighthouses, and make them dioptrics? On the suggestion of a leaf-cricket, I once thought a file attached to a drum and fiddled on would make a good fog signal, but a mechanical friend said it would never hold its own with the steam whistle.

ON February 5th, the Duke of Westminster laid the foundation stone of the new Chester Museum, which is "intended for teaching, for study, and for exhibition." Readers of the life of Charles Kingsley and of "Town Geology" will hardly need to be reminded of the interest he took in the Chester Natural History Society.

NOTES ON FASCIATION.

THE subject of abnormal growth is always associated with various conclusions as to the origin, use, &c., of such abnormalities, consequently your previous correspondents came to different conclusions. Mr. Gibb does not hesitate to conclude that fasciation has its origin in the embryo, and in this conclusion I think he is well supported by such instances as the cauliflower, and celosia; in both, fasciation has become hereditary, and the malformation is perpetuated by seed. Last summer I paid some attention to the subject and found that fasciation was far more common in cultivated plants than in our wild flowers. Amongst the former I found the compositæ especially prone to fasciation of the flower heads, dahlias, zinnias, and helichrysums often occurring with misshapen and enlarged heads, due to the cohesion of the capitulum in an early state of growth. *Azalea Indica*, and rose "Paul Néron" were both affected with a flattened kind of stem, which was clearly traceable to fasciation; in these two cases the terminal bud died, so that I had no chance of further observing the growth.

Amongst wild flowers, I noticed the common daisy (*Bellis perennis*), with an abnormal flower head. The white dead-nettle (*Lamium album*) I found with a thickened stem, in which I was unable to trace anything pointing to two cohesive stems, owing to the whole of the stem being very curiously curved and twisted. I planted last April a few plants of *Chrysanthemum leucanthemum* (the ox-eye daisy), taken from a poor pasture, in good garden soil. From one of the plants a few misshapen flowers were produced, which, on close examination, I found to be due to the fasciation of the capitulum. I isolated the plant by removing it with a large ball of earth, and let it seed itself. This spring there are some fifty or sixty seedlings growing under and around the old plant, and I shall carefully note what proportion of them have abnormal flowers. I noted one other instance where the seed does not seem to me to perpetuate abnormal growth. *Sedum glaucum* when taken from rockwork and planted in rich soil produces "coxcombs," which are due to coalescence of two or more stems, but I have been unable to find the character in seedling plants.

In examining cases of abnormal growth, care must always be taken to distinguish between mere redoublement of the parts of a flower, and enlargement due to the phenomenon of fasciation.

JOHN W. ODELL.

Pinner.

SIR JOHN LUBBOCK points out that in old holly-trees the leaves above the reach of browsing cattle tend to lose their spines. Have any of our readers observed this?

SCIENCE-GOSSIP.

THE question of civilisation and eyesight still continues to engage attention in recent numbers of "Nature." Lord Rayleigh suggests that the reputed advantages attributed to savages are not possessed by them, inasmuch as a limit is imposed on the power of sight by the aperture of the eye, which limit he thinks is nearly reached by civilised physicists, and that any superiority which savages enjoy is a question of interpretation of what they see. Mr. Rand Capron considers that aperture may not be a fixed quantity, but variable in different cases, and capable of modification; while Mr. G. A. Berry suggests that among civilised peoples, where the law of the survival of the fittest is to some extent frustrated, those who suffer from short sight naturally tend to those occupations which suit their condition, tending also to perpetuate the condition in connection with those occupations.

IN a paper on British Snakes lately read before the Warrington Field Club, Mr. L. Greening describes in an interesting and popular manner the structure and habits of these animals.

IN a recent lecture on the Solar Corona, Dr. Huggins, F.R.S., is reported (in the "English Mechanic") to have said, with regard to the matter of the corona, as distinguished from gas, that "if there were but one particle of matter in every cubic mile, it would account for the corona, the particles being so close to the brilliant source of the light of the sun." "In the high vacua used by Mr. Crookes, the residual material particles represent a crowded city as compared with the coronal waste."

THE death is announced of Dr. Samuel Rowbotham, author of "Zetetic Astronomy," and the upholder of the theory that the earth is flat. He was best known under the *nom de plume* of "Parallax."

THE council of the Geological Society has awarded the Wollaston medal to Professor George Busk, for his palæontological researches in the Polyzoa and the larger Vertebrata; the Murchison medal to Dr. Ferdinand Römer, of Breslau; the Lyell medal (with a grant of £40) to Professor H. G. Seeley, F.R.S., in recognition of his investigations into the anatomy and classification of fossil reptilia, especially the Dinosauri; and the Bigsby Gold medal to Professor Renard, of Brussels.

IN "Science" for February, is an account of the building of the Washington National Monument, U.S.A. It was begun in 1847, and, after some delay, was finished last December. It is a sharply pointed four-sided tapering shaft, standing on a base of masonry, and built of marble, iron, granite, &c. It is probably the loftiest structure in the world, being 555 feet high.

As a result of numerous observations on underground temperatures, and a consideration of the conditions under which they were conducted, Professor Prestwich, F.R.S., suggests 1° F. for 45 ft. as the mean rate of increase of temperature below ground. This is a more rapid increase than that hitherto generally accepted, viz. 1° F. for 60 ft.

Mr. A. G. Bell furnishes statistics to "Science" founded on the United States census for 1880, bearing on the question whether defects of the senses are correlated to one another. He considers that they are, and that instead of a defect in one sense being usually compensated by special excellence in another, the census returns "indicate that the deaf are much more liable to blindness than the hearing, and the blind more liable to deafness than the seeing;" and he further thinks that there is some correlation between these two defects and idiotcy and insanity.

We have received a copy of the Guide to the Fossil Fishes in the British Museum of Natural History at South Kensington. It consists of over 40 pp. and is profusely illustrated, containing also an Introduction by Dr. H. Woodward, a copious index, and a list of some important works of reference.

Messrs. W. Swan Sonnenschein & Co., will shortly publish a translation by Professor Hillhouse, M.A., of the Mason Science College, of Strasburger's "Das Reine botanische Practicum," a book which is a condensation of a much larger work by this most acute and active of German botanical observers, published in the spring of last year. It is intended chiefly for beginners, both students and amateurs, its great peculiarity being the method whereby, starting with the use of the microscope in the study of objects of the simplest character and needing no preparation (e.g. starch grains), the student is carried by thirty-two successive and easy stages up to work of the greatest difficulty.

The question of vivisection has been again raised at Oxford, the occasion being a decree for payment of £500 a year for three years to Dr. Burdon Sanderson, the Waynflete Professor of Physiology, "for assistance, coal, gas, water and other expenses of his department." The anti-vivisectionists made strong efforts to oppose this grant on the ground that, though Dr. Sanderson had pledged himself not to perform experiments on living animals in his lectures, this undertaking would not be binding on his successor. The decree was however passed, after a somewhat uproarious discussion, by 412 against 244.

It appears that even tornadoes have been submitted to the art of the photographer. Woodcuts prepared from photographs of tornadoes may be found in "Science" for February. They are reproduced from other papers, and their authenticity is assumed.

Incandescent electric lamps are to be used to illuminate the gardens in the coming "Inventories" exhibition, and also in the interior of the shops in "Old London," which attractive feature of last year's exhibition is to be retained this year.

The Dover Field Club and Natural History Society had, on February 19, a very successful and largely attended conversazione, when many objects of interest in different departments of Natural Science were shown.

The Society of Amateur Geologists is progressing. Dr. Maybury has become the first president of this society, and will probably deliver his presidential address at the meeting in April. At the last meeting Mr. Allen-Brown, F.R.G.S., read a paper on Palæolithic Man in North-West London.

It is said that the Skrivanow primary battery has been successfully adapted to the production of portable electric lamps for domestic use. The materials used in the cells are chloride of silver, zinc, and a weak solution of caustic potash; the light can be continued for twelve hours; and the cost of maintaining the battery in working order is very small.

The following has been forwarded to us by an Australian correspondent, Mr. C. Burt, Melbourne, Victoria. "As hydrogen gas is the lightest known element, and as all water contains in its composition eight parts oxygen, and one part hydrogen, it may be concluded that a tremendous amount of these and other gases were liberated at the late Sunda volcanic action of nature, by the decomposition of the water by electric force. Should this have been the case, the hydrogen and other gases would at once ascend to the outside of this planet's envelope of atmosphere, or be suspended in it, and the sunlight shining at an oblique direction at sunset may possibly reflect to us the peculiar tint we see. Hydrogen and other gases have the power of refraction of light. Could this be proved, in 1899, in the month of November, 14, 15, or 16, a curious freak of nature may happen, when the belt of meteors pass through this planet's orbit."

"The Medical Annual and Practitioner's Index" for 1885, edited by Dr. Percy Wilde (London: Henry Kimpton, High Holborn) is in its second year of issue; and, successful as it proved last year, there is no doubt the editor has gained by his first year's experience, so as to produce a better and fuller volume for the present year. Practically, it is a Handbook, or Yearly Record of useful information on subjects relating to the medical profession. Dr. J. E. Taylor, F.L.S., contributes an "Annual Review of Popular and General Science," and there are also papers on "Cases of Insanity," by Dr. Robert Jones; "Sanitary Memoranda," by C. W. Dymond, C.E.; "Bandages," by Dr. P. Wilde, &c. &c.

NEWS appears in the "Pall Mall Gazette" from Miss Marianne North, who is at present in Chili and wrote last December. Speaking of the embothrium, which has sprays six or eight feet high covered with pure vermilion flowers, she says: "But I saw none grow into such a tree as I saw in my cousin's garden in Cornwall last year; perhaps it may enjoy a new soil and climate, and treat England as our common weeds do Chili; they have quite driven the natives out on the great plain or valley of Santiago, and show unbroken masses of camomiles, thistles, turnips and cornflowers, far stronger than those of Europe."

MICROSCOPY.

LIVERPOOL MICROSCOPICAL SOCIETY.—At the last monthly meeting of the above society, Dr. W. Carter called attention to some further investigations of Monsieur Pasteur which proved that no germination of seeds could take place in sterilised earth, and referred to some experiments of his own with mustard seeds. Afterwards, Dr. J. Sibley Hicks read a paper on "The Aphides and their Habits." He referred to the wide distribution of these insects, and how each plant has its peculiar species of aphis which occasionally works immense destruction. The ravages of the hop aphis were specially referred to, and details given of the enormous loss incurred by hop growers through this pest, which in the year 1882 amouuted to £1,750,000. This damage is explained by the fabulous reproductive power of the aphis; a single female may see in her own lifetime a progeny of over 4500 million individuals. Another destructive species occurs on apple-trees, and is known as American blight, which was first observed in 1785 in an orchard near London. In more recent times the vine aphis phylloxera has done immense damage in the vineyards of France, where it was first found in 1865; these species attack the leaves and roots, &c. Fortunately the aphides have numerous enemies, notably the ladybird and its caterpillars, especially the latter, each of which will devour forty to fifty daily. Other enemies are the lacewing fly and its grub, the ichneumon fly, which deposits its eggs in the body of the aphis, where they are hatched, &c.

THE QUEKETT CLUB.—The March number of the Journal of the above club contains the inaugural address of the president, Dr. Carpenter, in which he gives an account of the structure of Orbitolites. The paper is well illustrated, and concludes with some remarks addressed to would-be workers in science. At the November meeting of the same club, Dr. M. C. Cooke, and apparently also Dr. Carpenter, agreed with the opinion expressed in a paper by Mr. Bates, that at present there is no sufficient ground on which to assert the distinct sexuality of the threads of the Zygonemaceæ. At the same meeting Mr. E. M. Nelson announced that he had recently been successful in detecting a flagellum on the cholera bacillus.

ROYAL MICROSCOPICAL SOCIETY.—Mr. F. R. Cheshire, F.R.M.S., contributes to the Journal of the above Society (February) a paper, accompanied by illustrative plates, on the receptaculum seminis and adjacent parts of bees and wasps. In it he describes minutely the anatomical structures bearing on the vexed questions of the reproduction of bees. The same number contains also a paper on Variations in the Development of a Saccharomyces, by Mr. G. F. Dowdeswell; Notes on Tyroglyphidæ, by Mr. A. D. Michael; and the usual capital summary of current researches.

COLE'S "MICROSCOPICAL STUDIES."—These welcome serials are issued with remarkable punctuality. Part 3 of the "Studies in Microscopical Science" deals with *Vaucheria racemosa* (illustrated by a coloured plate and slide showing oogonia and anthrozoa); with the "ovary of kitten; "alveolar pneumonia," and "foot of spider"—all illustrated by plates and slides, whilst the letter-press descriptions are remarkably lucid and terse; in fact, they are models of scientific teaching.

CRYSTALS FOR THE POLARISCOPE.—I should be glad to know if any of the crystals of the various salts mounted for polariscopic objects are really permanent. "A thing of beauty is a joy for ever," says the poet. About the beauty of the crystals there cannot be two opinions; but, alas! so far as my experience goes, it is of a decidedly fleeting character. I have slides by Topping and others, nearly all of which show signs of deterioration, and in some the crystals have vanished altogether. This cannot arise from damp, as my cabinet is kept in an exceptionally dry room, in proof of which I may state that such a thing as mould I have never seen in my cabinets of entomological specimens. Before, therefore, I expend anything more on this class of microscopic mounts, I would ask for the advice of microscopists, and information as to the durability of crystals.—*Joseph Anderson, jun.*

STAINING NERVE AND MUSCLES.—Would any of your readers furnish me with the most delicate stains and tests for the elucidation of very obscure nervous and muscular structure in fresh minute organisms, with best mode of application?—*E. B. L. Brayley.*

UNRECOGNISED BIRDS.—A correspondent says he saw two strange birds on a Yorkshire moor. They were probably stonechats (*Saxicola rubicola*), birds which are almost confined to heaths and moors.—*H. Lamb, Maidstone.*

ZOOLOGY.

Motion in Spider's severed Leg.—The "spider" referred to under the above heading, in "Science-Gossip" for March, 1885, p. 69, was in all probability one of the Phalangiidæ or harvest-men, not a true spider. Harvest-men, especially those of the genus Liobunus, throw off their legs voluntarily and with great facility, but never, so far as I am aware, unless the leg is in a captive state. The leg thrown off will continue to move for some little time, its muscular power and nervous sensibility being very great. Escape is doubtless the motive on the part of the harvest-man, but whether any idea of drawing off the attention of the enemy, by means of the motion of the cast-off leg, is mixed up with that motion, seems improbable. True spiders, especially those of the genus Clubiona, will also throw off their legs, but they appear to require a greater purchase to enable them to do so than the Phalangids, and their legs when severed have not nearly the same amount of motion. I have always found that if a spider be held by two of its legs it cannot obtain the necessary purchase, and so cannot throw off the limb. It is quite true that the spider, or harvest-man, suffers, apparently, a minimum of inconvenience in the loss of a leg or two, but there must certainly be a considerable drain on the system as the stump always bleeds freely. I once saw an example of *Liobunus rotundus* running with very fair speed, and in wonderfully steady time, having only three out of its eight legs remaining.—*O. P. Cambridge, Bloxworth Rectory.*

Melanic Variation in Lepidoptera.—In his presidential address to the Yorkshire Naturalists' Union, "On some probable causes of a tendency to Melanic Variation in Lepidoptera of high latitudes," Lord Walsingham remarked that northern representatives of southern forms of lepidoptera showed a tendency to assume a darker or more suffused colour, the same tendency being observable in those frequenting high mountain ranges, and he discussed various reasons which have been suggested to account for such phenomena. He supposes it to be, perhaps, due to the advantages derivable by the insect from its being able the more rapidly to absorb invigorating warmth; and also to surplus vital energy leading to the deposition of pigment. He pointed out also that though the same darkness of colour would cause a more rapid loss as well as gain of heat, this would not be of so much consequence in the case of insects, while in the case of the power of dark races of mankind to support tropical climates, the tendency of the darker skin to absorb heat would be compensated by the quicker loss of the same.

Another attempt to carry humble-bees to New Zealand to fertilise the clover has failed. All the insects were found dead when the case was unpacked.

BOTANY.

Cocain in Different Species of Erythroxylon.—A grain of cocain, from the South American tree *Erythroxylon Coca*, has been selling in London up to three shillings and sixpence as a retail price, and the Secretary of State for India has forwarded to the Government of India a letter from Surgeon-General Balfour, suggesting that the plant should be introduced into that country. Surgeon-General Shortt has been asked to ascertain whether similar properties to those possessed by *E. coca*, may not be found in some of the East Indian species. Sir Joseph Hooker's "Flora Indica" enumerates seven species there: *E. Burmanicum; E. Kunthianum; E. lanceolatum; E. lucidum; E. monogynum; E. obtusifolium* and *E. sideroxyloides.*

The Edelweiss.—So favoured by legend and romance, the edelweiss is worth cultivating, and this is easily done. It is rather a new introduction to our florists' catalogues, but every lady may soon have it in her drawing-room, if she wishes. It will flower almost as well in town as in country, at least under glass. I got some seed of Freeman's, of Norwich, two years ago; and, sown early in spring in a flat pot, with sandy peat and good loam, and kept moist, it vegetates in a fortnight, and must then be pricked out, and put in a cool frame, and then planted out of doors in about six weeks. It takes as much sun as can be given it. The above are the nursery directions, and, having followed them, I raised some nice plants. Any lady who wishes to emulate the brides of Switzerland has only to order her gardener to sow the seed, and the edelweiss may be ready for the boudoir or the hair in a few weeks, as easily grown as forget-me-nots. The mystery of the edelweiss may be then studied at leisure, as long as it continues flowering, or it may be put into an album or herbarium when it has ceased to do so.—*John Emmet, F.L.S.*

Fertilisation of Geraniums.—The following observations on *Geranium phæum* and *G. sanguineum* may be of interest:—At an early stage of inflorescence the pistil is surrounded by the anthers in such a manner that if the pollen was shed, and the stigma ready to receive it at the same time, self-fertilisation would be inevitable. After the pollen is shed, the anthers fall off and the filaments turn away from the style. Then the stigma opens out and shows its five-cleft form, ready to receive the pollen-grains which may be brought by bees from other flowers. Afterwards it closes again and remains so. —*G. W. Bulman.*

Blossoming of the Artichoke.—The flowering of this plant appeared to be general in Middlesex, last autumn. Our crop here, in N.W. Middlesex, was much finer than usual, and nearly every plant

flowered; early frosts prevented the seed from coming to maturity. It would be interesting to know why this plant is so shy of flowering, more especially as several other species of Helianthus from S. America are noted for their free flowering habits; *H. tuberosus* being a native of Brazil, and not, as its name implies, a native of the Holy Land.—*J. W. Odell, Pinner.*

Blossoming of the Artichoke.—In answer to E. A. (Science-Gossip, No. 243), I have noticed the blossoms of *Helianthus tuberosus* during the past autumn in Kent as well as here in Jersey.—*M. E. Pope.*

Helleborus viridis.—When examining for the first time a plant of *Helleborus viridis*, I was struck with the curious form of the stem immediately beneath the flower. It has a wrinkled appearance for about half an inch. Can any one give me information about this phenomenon; the nature of it, and reason for it? I have examined it under the microscope, but cannot see anything remarkable, excepting two lines inside the stem, which appear to me to be nerves. It is the same as the pulvinus of the cotyledons, described by Darwin in "Movements of Plants."—*H. P. FitzGerald.*

Teratological Notes. *Dactylis glomerata.*—I recently obtained at Bramcote, near Nottingham, by the roadside, near a farmhouse, two specimens of an abnormal development in a grass, I take to be *Dactylis glomerata,* the rough cock's-foot grass, but the inflorescence is slightly altered owing to the malformation, the panicle being very irregular; it is well described in Maxwell T. Masters' work as '*viviparous grass.*" I cannot do better than quote his words. "The spikelets of certain grasses are frequently found with some of their constituent parts completely replaced by leaves, like those of the stem, while the true flowers are usually entirely absent; a shoot in fact is formed in place of a series of flowers. In these cases it generally happens that the outermost glumes are changed, sometimes, however, even the outer and inner paleæ are wholly unchanged, while there is no trace of squamulæ or of stamens and pistils within them, but in their place is a small shoot with miniature leaves arranged in the ordinary manner. This occurs in many species, amongst others *Dactylis glomerata.*"—*C. T. Musson, Nottingham.*

Pelargonium Leaf.—A short time ago a curious leaf malformation was brought to me. A pelargonium leaf had developed into the shape of a wineglass, the bell being like a hollow cone, the leaf-stalk springing from the apex, and, of course, the hollow base upwards.—*C. T. Musson, Nottingham.*

The Exploration of Roraima.—Information has been received from Mr. im Thurn, who is at present in British Guiana, to the effect that he has succeeded in ascending Roraima. He found the plateau treeless and cold, and by no means so isolated as it has been supposed. His party could only explore for a short distance, but he speaks of the scenery of the mountain and the vegetation on the top as most wonderful, and he found several new species of plants there, but no new animals.

GEOLOGY, &c.

Archæan Rocks of the North-West Highlands.—In the October number, lately issued, of the "Proceedings of the Geologists' Association," is a long paper by Professor J. F. Blake, F.G.S., on the stratification of the Durness and Eriboll district of the North-West Highlands, where Archæan gneiss is found overlying beds of later formation, and the subject is also dealt with in the same number by Professor Lapworth. In referring last year to the work done in the Geological Survey in this region, Professor Geikie stated that the prodigious displacements of strata to be found there are without a parallel in Britain. Reversed faults, with so low a hade that the rocks on the up-throw side are pushed almost horizontally over the others, produce dislocations to which the name "thrust-plane" has been applied, the effects being almost incredible. "In Durness, for example, the overlying schists have certainly been thrust westwards across all the other rocks for at least ten miles."

Drift-Coal.—The March number of the "Naturalist" contains a note by Professor G. A. Lebour on an Abnormal Deposit of Drift-Coal in North Durham, which consists of a bed, over two feet thick, of comparatively large coal fragments, which however are unlike any coal-measure coal known in the neighbourhood, while they do not appear to have travelled far.

The Flint Deposits on Midgeley Moor.—Another vigilant search was made for flints on the now well-known Midgeley Moor on Monday, March 2, 1885, with very satisfactory results. Among the finds may be mentioned several "chips," "cherts," a "scraper," and two perfect "arrow-heads," one not very well worked, but the other as sharp-pointed as a needle, with a rounded base and angular sides. The presence of so many chips, cores, &c., with numerous arrowheads, it was thought may indicate the site of an ancient flint manufactory.—*S. F., Mytholmroyd.*

"Schillerization."—What is it? At a recent meeting of the Geological Society of London a paper by J. W. Judd, F.R.S., was read, on "The Tertiary and Older Peridolites of Scotland," in which the author proposed the term "schillerization," to denote "the development of microscopic enclosures, in the form of plates or rods, along certain planes within

the crystal, giving rise to metallic reflections or a play of colour." He further stated that schillerized forms are produced by deep-seated hydration, weathered forms being due to hydration near the surface.

A Crinoid with Articulating Spines.—In the March number of "The Annals and Magazine of Natural History," may be found an account of a new species of crinoid from calcareous shales of middle Devonian age at Arkona, Province of Ontario, Canada, collected and described by Dr. G. J. Hinde, F.G.S. The author refers to the description in 1883, by Professor H. S. Williams, of a crinoid with movable spines, to which the name of *Arthroacantha Ithacensis* was given from Devonian strata at Ithaca, in the State of New York. Of this, impressions only were found, while Dr. Hinde's specimens were fragments themselves. This new species, which was found at a lower geological horizon than those of Professor Williams, Dr. Hinde has named *Hystricrinus* (= *Arthroacantha*) *Carpenteri*, and he says that his specimens "conclusively show that Professor Williams had correctly interpreted the impressions and casts of the spines and plates in the Devonian shales, and that, however, novel the feature of movable spines may be in the history of the Crinoidea, no doubt can be entertained of the fact."

Silurian Insect and Scorpions.—The following is taken from some Notes contributed to the "Geological Magazine," by Mr. Herbert Goss, F.G.S. Till lately fragments of neuroptera found in Devonian rocks of North Brunswick were the oldest known insect fossils. Recently the wing of a cockroach (Blatta) has been found in middle Silurian rocks at Jurques, Calvados, France, and to this, the oldest-known insect, and oldest-known terrestrial animal, the name of *Palæoblattina Douvillei* has been given. Recently also two scorpions, insectivorous animals, whose presence furnishes additional evidence of that of insects, have been found in Silurian rocks, one from the Ludlow beds (upper Silurian) of Lesmahagow, Lanarkshire, and the other from the upper Silurian of the isle of Gotland. The latter, which has been named *Palæophonus nuncius*, is said to have been clearly an air-breathing animal, and to have observable in it "the presence of four pairs of thoracic legs, which are stout and pointed like those of the embryos of many tracheata, and of forms like campodea. This form of the leg no longer exists in the fossil scorpions of the Carboniferous formations, in which fossils these appendages resemble those of existing species."

Coral-stone converted into Phosphate of Lime.—Mr. George Hughes finds that this change has taken place in deposits in the West Indian islands of Berbuda and Aruba. In the latter case the deposit occurs at a headland called Sierra Colorado, and Mr. Hughes is of opinion that this was formerly the resort of sea-birds, whose excrement, which contained soluble phosphates, caused the change in the rock.

Paramorphoses of Pyroxene into Amphibole.—From the paragraph in Science-Gossip for March, it is refreshing to find that some of the British scientists are taking up this subject practically; as it seems rather derogatory to British lithologists that just as the Americans are casting aside their "fad" about the old crystalline rocks, the former should step into their old clothes. Mr. Harris Teall, however, can scarcely be said to be the first in the field, as there are a few others before him, as mentioned in the recently published paper by Professor G. H. Williams of John Hopkins College, Baltimore ("American Journal of Science"). Paramorphoses is the field to which the microscopist ought to turn his attention, as by it he learns what changes may and do take place during metamorphosism, no matter what is the age of the rocks. The changes to which the pyroxene is subjected are those more easily seen; but associated with them are other changes, as of the felspars; the latter, however, seem to be, at least in part, more methylatic than paramorphosic, as there appear to be new minerals developed; the change of a triclinic into a uniclinic felspar being accompanied by the development of accessory minerals. This subject is, however, treacherous ground, as it seems possible that it may be paramorphoses and not methylosis that has been at work; as the different minerals that make up a triclinic felspar may be developed and not actually chemically changed. There are some peculiarities in connection with pyroxenic rocks, often absent, but not always, in felstones. Very commonly associated with a pyroxenic rock, let it be as an "intende" or mass, bedded, or as a dyke, there are schistose portions, and the pyroxene in the latter changes much more rapidly into hornblende, than the pyroxene in the more solid portions; also a pyroxenic tuff or tuffose rock will change more rapidly than a compact rock. Subsequently, however, there appears to be a change in their relative sensibilities, as, during more excessive metamorphic action, the compact rock may change into a granyte, while the hornblendyte retains more or less its schistose character. The ordinary changes seem to be in the following order:—1st, there is the pyroxenic rock, in part tuffose, and in part compact; 2nd, hornblendyte, and a rock in part pyroxenic and in part amphibolic; 3rd, hornblendyte and hornblendic gneiss; 4th, gneissose hornblendic granyte, having subordinate hornblendic schistose beds or courses; and 5th, metamorphic granyte; the action having become sufficiently intense to destroy the individuality of the original rocks.—*G. H. K.*

"Our Common British Fossils, and Where to Find Them." By Dr. J. E. Taylor, F.G.S.,

F.L.S., &c.—Our position with regard to the authorship of this book forbids us doing more than announcing its recent publication. (Chatto & Windus, Price 7*s.* 6*d.*) It contains about 350 pp. and 331 illustrations. The thirteen chapters of the book are headed as follows: 1. Fossil Sponges, &c.; 2. Fossil Corallines; 3. Fossil Corals; 4. Encrinites; 5. Fossil Star-fishes and Sea-Urchins; 6. Fossil Worms; 7. Trilobites, and other Fossil Crustacea; 8. Fossil Sea-Mats; 9. Fossil Lamp-Shells; 10. Fossil Mollusca (Primary); 11. Fossil Mollusca (Secondary); 12. Fossil Mollusca (Tertiary); 13. Fossil Cephalopoda. Perhaps the best outline of the author's intention with regard to this Handbook will be conveyed by quoting the preface:—"The following pages are intended as a help to the young student of geology, who is usually bewildered by the abundance of invertebrate fossils, when he commences collecting them himself. There are books of a much higher and more extensive character, such as the treatises on Palæontology by Owen and Nicholson, to which I am hopeful this present volume will prove introductory. I have not attempted to introduce the student to other than invertebrate fossil animals, not only because these are by far the most numerous, but also because such an attempt would have expanded the volume beyond due limits. I have recollected the nature of the difficulties which beginners in fossil-collecting feel, and have tried to meet them. My hope has been rather to whet the appetite than to satisfy it."

Flint or Stone Implements.—In reply to query by Mr. Hewitson, I may say that there have been finds of pre-historic implements in Allendale and the surrounding district. The implements were celts, arrow-heads, flakes, chippings and cores. The materials consisted of greenstone and flint. The localities were Allendale Fell, Kilhope Fell, Ramshaw Fell, Tows Band, and Cowburn district. In 1878, the Rev. W. Howchin, F.G.S., contributed a paper on this subject to the Natural History Society of Newcastle-on-Tyne.—*J. T. T. Reed.*

NOTES AND QUERIES.

Arum Maculatum.—On reading Mr. Williams' article on this plant I referred to an old work wherein I find the following account, which I quote verbatim, thinking it may be of interest to him as well as your readers. The book is titled "Pharmacopœia Officinalis Extemporanea, or, a Complete English Dispensatory," by John Quincy, M.D. printed for Thomas Longman, at the Ship in Paternoster Row, London, 1739, Part ii. Sect. 4. Of Balsamics. Radices, Roots of, Ari, Cuckow Pint; distinguished—vulgare by Gerhard, and—maculatum & non maculatum, by Parkinson. It grows in Hedges and Shady Places. This Plant appears very early in the Spring. It is most violently pungent and volatile; insomuch that the least Touch of its Juice upon the Tongue is scarce tolerable, and almost caustic. This Quality makes it recommended in all Viscidities, and in phlegmatic and scorbutic Cases; because it penetrates and rarefies tough Concretions and Infractions of the Glands and Capillary Vessels. It has been prescribed in humoral Asthmas and Obstructions of the Bronchia; and by the great Force and Activity of its Parts it breakes thro' and wears away those little Stoppages in the Extremities and cutaneous Glands, which occasion Itchings and Scabs; and is therefore justly rank'd amongst the most powerful Antiscorbutics. Van Helmont commends it greatly, with Vinegar in Bruises or Falls; because it will prevent the Blood from stagnating and falling into Grumes, upon the injured Parts. And Etmuller, with a Mixture of Sallads, seems to think it will form a Tertium Quid, very much of the Nature of Nasturtium. Some have affirmed a Dram of this Root fresh powder'd and taken in any proper Vehicle, to be a most excellent and infallible Remedy against Poison and the Plague. Mathiolus commends, and with great reason, a Cataplasm made with this fresh bruised and Cow-dung, to be applied hot in arthritic Pains; for such a Composition cannot but do all that is expected from the most penetrating Substances. Schroder reports, that the distilled Water from its fresh Leaves, is a Specific in Melancholy and Distraction. Dr. Grew says that this Root kept long dry, loses its efficacy; which it certainly does; the volatile Parts, in which it consists, flying away, and leaving it insipid.—*John Redding, Dublin.*

Unrecognised Birds: waxwings?—The birds seen in Yorkshire by Mr. Birkdale (p. 69) were probably specimens of the Bohemian chatterer or waxwing (*Ampelis garrulus*, Linn.), an irregular winter visitor to this country; if so, they would have a slight crest, a dark throat, and white bands on the wings, besides the features he mentions, and the wax-like appendages to wings and tail, of a bright scarlet, but perhaps, not visible at a distance, from which they are named; in young birds some of these characteristics would be wanting. The date seems unusual. Stone-snatches would be wheatears, whinchats, or stonechats.—*J. E. Kelsall.*

Last Autumn's Aberrations.—I forward you a cherry, gathered on November 6th, rather damaged by birds, but rich in colour; and also a cluster of strawberry bloom and green fruit. Both were found out of doors. The gardener, an old and observing man, never before met with a cherry at this season. The autumnal tints, too, were remarkable, and surpassingly beautiful. Prior to the rougher nights of early November, elms retained full luxuriance of foliage, and a few days previously, showed each a daily increasing single blotch of sharply defined and unbroken orange colour, the rest of the leaves remaining unchanged in hue, and all of them as to denseness.—*S. S.*

Abnormal Orange.—This orange consists of an inner and an outer one; the inner being of the shape of a miniature barrel, flat at the top, and, as it nears its other extremity, rather abruptly terminates in a blunt point. It is at this point that a pithy stem joins it. The outer part of the orange discloses nothing unusual to view, being of the ordinary shape. It is also remarkable for its paucity of pips.—*Arthur Ayling.*

Illustrations of Pond Life.—Will any reader of Science-Gossip kindly say how I can give illustrations of pond life with the lantern in a small hall.

In all the lists of Dr. Maddow's photographs of microscopic objects, I fail to find any representing the Infusoria, Polyps, Rotifers, etc. Can lantern photos of these be had?—*G. M. B.*

Pond Life in Nottinghamshire.—Can any reader inform me where the best ponds, ditches, or streams, are to be found in Nottinghamshire for micro life, viz., *Hydra viridis*, *Hydra fusca*, *Stentors*, *Vorticella*, *Volvox globator*, *Melicerta ringens*, Desmidiaceæ, or Diatomaceæ? Any information on this point will be much valued.—*W. H. P.*

Branched Tentacle of Hydra.—Some months or so since, Mr. Dunn exhibited at the Birmingham Microscopists' and Naturalists' Union, a specimen of *Hydra viridis*, having a small tentacle growing out of one of the others, and looking like the letter Y. A short time after, I found two specimens of *Hydra vulgaris* having the same peculiarity, except that one branched out much nearer the base than the other. Another member of our society, Mr. Henry Hawkes, also found a specimen. As I have never read of anything of the kind, I should be glad to know if any one else has noticed a similar occurrence? I have mounted a specimen, and shall be happy to show it to any one calling on me at 33 Geach Street, Birmingham.—*William Tylar.*

Water-Voles (*Arvicola amphibius*).—I have often seen water-rats gnawing rushes at the edge of the water. They are plentiful along the banks of the Medway here.—*H. Lamb, Maidstone.*

Paradise Tree.—The flower your correspondent F. S. mentions is an orchid and is indigenous to the Isthmus of Panama, and is rare, even in its native land. The plant grows to a height of about 4 feet, the flower being of a creamy white colour, exhaling a faint perfume. The petals of the flower are folded back, and in the centre are arranged in the exact shape of a small white dove with wings extended, as if just about to take flight. It is regarded with religious veneration in its native land, and the inhabitants have given it the name of "Espiritu Santo," the flower of the Holy Spirit, but I unfortunately do not know its scientific name. Of its existence there is no doubt at all; it is, I believe, growing at Chatsworth, and I know it is or was in the conservatories at Windsor.—*M. L. S., Pendleton.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

We request that all exchanges may be signed with name (or initials) and full address at the end.

F. Marshall.—Morris's "History of British Birds." For price, consult the secondhand catalogues of W. P. Collins, 157 Great Portland Street, or W. Wesley, Essex Street, Strand.

A. S. B., and others.—Perhaps you are not aware that furze may be found in blossom all round the year, under anything like favourable conditions. The furze sent is *U. Europæus.*

Faux.—This is not an uncommon thing in bulbous plants, but occurs in the orchids more particularly.

C. Fred Fox.—The paper you mention on the "Cephalopoda of the Isle of Wight," by C. Parkinson, F.G.S., is to be found in No. 177 of this journal, viz., September 1879.

W. W. Bladen.—Your name as author of the paper on "Nidification in Staffordshire," in our last number, was unfortunately omitted.

G. E. East, jun.—"The Natural History Journal" is not in existence. "The Annals and Magazine of Natural History" (London: Taylor & Francis), price of an ordinary monthly number, 2*s.* 6*d.* "The Geological Record" (London: Taylor & Francis), is published annually to subscribers, price 10*s.* 6*d.*

E. C.—We cannot undertake correspondence of the kind you mention other than that connected with this column.

F. Harding.—Get J. Harting's "Rambles in Search of Shells."

F. J. G.—Your letter with regard to M. B.'s exchange notice is the first we have received. We hope we shall not hear the like from others, which might render it necessary to take further steps.

B. B. (Bath).—Thanks for your note. Your address has been taken in case it might be wanted for future reference.

H. A. F.—For information as to works on the botany and natural history of Florida, apply to the editors of the "American Naturalist" (Philadelphia) or the "Botanical Gazette" (Indianapolis).

E. A.—We have received a number of letters replying to E. A.'s query about the blossoming of the artichoke in England. It blossomed at Croydon and elsewhere, besides the places alluded to in the notes now published.

J. Ritchie.—(1) Grattan's "British Seaweeds" ("Bazaar" Office), published at 2*s.* 6*d.* Landsborough's "British Seaweeds," published at 10*s.* 6*d.* by Lovell Reeve, coloured plates. (2) Stark's "Popular History of British Mosses" (Routledge), published at 10*s.* 6*d.*, coloured plates. Many years ago a special number was published of Science-Gossip on Hepaticæ, by Dr. M. C. Cooke. It is now out of print, but may possibly be obtained through some scientific bookseller. Dr. Carrington's work on the Jungermanniaceæ is slowly coming out.

W. B.—Your specimen is *Betula alba*, or white birch.

H. H.—See articles in Science-Gossip on "Hybernation of Swallows," by Dr. C. C. Abbott.

J. B. B.—Your specimens are as follows: *Xenodochus carbonarius*, or Burnet leaf; 54, *Polytrichum*; 55, species of *Pterogonium*; 80, imperfect. Probably a pinnule of *Aspidium falcatum*.

P. O'K. (co. Clare).—Your specimens are the cup-moss lichen (*Cenomyce pyxidata*), the reindeer's horn lichen (*Cladonia rangiferina*), and catkins of the common club-moss (*Lycopodium clavatum*).

H. M.—Your specimen is the partition or septum of the fruit of the garden plant called Honesty.

M. A. M.—The specimen you enclosed is a fragment of the egg-capsules of the common whelk (*Buccinum undatum*). See Taylor's "Half-hours at the Seaside," for figures and description.

F. R.—Your slide of specimen was smashed. "The white object attached to a pebble" and "dropt by a *male bird*," is the entire mass of egg-capsules of the white whelk, referred to above. The other object is a fresh-water alga, showing oogonia.

F. W. C.—See recent numbers of "Nature" for letters on lantern screens. A lantern-microscope would be very helpful to you in your difficulty. Apply to Messrs. Chatto & Windus for Hepworth's cheap treatise on the Magic Lantern, and how to work it.

S. J. M.—The following are excellent works connected with Sericulture: "Report in regard to the Manufacture of Raw Silk, &c., in India," 1836. "Cultivation of Silk in Australia, Sydney," 1870, "Silk Culture in Japan," "Roxburghe's Account of the Silkworms of Bengal," "La Sériculture," by Bavier, Lyons, 1874. You had better apply for any of these or other books on the subject, to B. Quaritch or W. Wesley, scientific bookseller, Essex Street, Strand.

J. E. R.—Your exchanged note is not in hand.

E. H.—1st. Foreign Conchology by Chenu, published in French; Wood's "Index Testaceologica"; Sowerby's "Genera of Shells." The above are abundantly illustrated with coloured plates. 2nd. Any London dealer, or the Assistants in the Conchological Department of the Brit. Nat. Hist. Museum. For British mollusca, see Gwyn Jeffrey's work in five vols.

EXCHANGES.

Good botanical, histological, crystals, polariscopic, diatoms, fish scales and miscellaneous, microscopic slides for others as good of bacilli, entozoa, algæ, desmids, zoophytes, rocks, fossil woods.—B. Wells, Dalmain Road, Forest Hill.

Wanted, Science-Gossip, Nos. 230, 231. What offers for Balfour's "Outlines" and Paley's "Theology"?—F. Marshall, Benwick, March, Cambridgeshire.

One or two specimens of *Testacella haliotidea*, taken in this locality, which I am willing to forward alive or dead for another equally rare species.—F. Fenn, 20 Woodstock Road, Bedford Park, Chiswick, W.

I WILL send twelve packets of micro material in exchange for a well-mounted slide.—G. A. Barker, 1 Northwold Road, Clapton, E.

SCIENCE-GOSSIP, 1876–79, bound in cloth; 1880 in numbers; also 1881, Jan. to April, Nov., Dec.; 1882, Dec.; Coleman's "British Butterflies;" Wood's "Common Objects of the Country;" Wood's "British Moths;" Brown's "Astronomical Geology." All the above clean copies, though marked with a stamp; will exchange for micro apparatus or material, or for land and freshwater shells.—B. B. W., 23 Batoum Gardens, West Kensington Park, W.

WANTED, a good turntable; also skull of bull frog, and skeleton of full-sized common frog.—K., The Manse, Bollington, near Macclesfield.

WANTED, lantern photographic slides; will exchange six sculpture and twelve abbeys and cathedrals, six castles, and twelve others, send list; or will give microphotographs mounted on 3 × 1 polished slips for lantern slides.—R. Blakeborough, Guisborough.

A DOUBLE nose-piece to fit Hartnack's microscopes, made specially by Collins, Great Portland Street, almost new; "Hogg on the Microscope," 6th edition, as good as new. Wanted, last edition of Carpenter on "Beale on the Microscope in Medicine."—E. R. T., 24 St. Patrick's Hill, Cork.

WANTED, a pair of healthy bullfinches in exchange for either vol. iii., iv., v., or vi. of "Boys' Own Paper," in monthly parts, with plates and index in perfect order, or vols. i. and ii. of Imison's "Elements of Science and Art," bound in tree calf.—E. P. Turner, 6 Dagnall Park Terrace, Selhurst, S.E.

MICRO slides: wing of *Papilis Paris* (green scales on rich brown ground) for other good slide. Please send box.—A. Downes, Glenmore, Waverley Road, Bristol.

DUPLICATES: *Amathusio phidippus, Aganisthos orion, Callidryasphilas, Megalura peleus, Papilio thoas*. Desiderata: other exotic butterflies, or pupæ of British lepidoptera.—Joseph Anderson, jun., Chichester, Sussex.

FINE examples of Australian foraminifera, selected and named, including Discorbina, Valvulina, Clavalina, Patellina, Nubecularia, and other rarities. Desiderata: Carpentaria, Tinoporus, Cymbalopora, Hanerina, Cassidulina, or any of the rarer species. Also rich foraminiferal material from the Tertiary beds of England and the continent.—W. Howchin, Goodwood East, Adelaide, South Australia. Parcels in bulk can be sent for enclosure, addressed as above, to the care of R. Fenwick, Sutton Street, Commercial Road East, London.

WILL forward ant parasites in exchange for anything useful in microscopy.—H., 1 Madelaine Square, Liverpool.

WANTED, a Rosszentmayer microscope stand. State exchange or price required to—S. C. L., 276 Middleton Road, Oldham.

"ENGLISH MECHANIC," Nos. 758 to 796, the following numbers missing, 770, 776, 788, 790; exchange for fine cock and hen bullfinch, or for a piping cock only. A printing machine and type also wanted.—E. P. Turner, 6 Dagnall Park Terrace, Selhurst.

WANTED, a hen ring-dove in exchange for a blue pigeon.—Frederick Harding, Shipley House, 13 York Road, Eastbourne.

WILL exchange one pair of blue pigeons for pair of dormice.—Frederick Harding, Shipley House, 13 York Road, Eastbourne.

FIRST twenty-four parts of "Entomologists' Monthly Magazine," foreign shells, a horn of rhinoceros, minerals, and sucking fish (remora), for foreign curios, or shells or micro slides.—F. M., 69 Duke Street, Old Trafford, Manchester.

WANTED, gold and silver medals, and collections containing rare foreign postage stamps, in exchange for natural history specimens.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WANTED, following nests, with clutches of eggs: dipper, ring ouzel, nightingale, stonechat, whinchat, grasshopper warbler, woodlark, cirl bunting, hawfinch, goldfinch, lesser redpole, &c. Offered, eggs, insects, shells, and various natural history specimens.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WANTED, various eggs in quantities, and nests with clutches of eggs of uncommon species. Offered, British and exotic insects and shells.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

L. C., Nos. 40, 1039, 1127, 1128, 1330, for exchange. Send lists to—H. Purefoy FitzGerald, M.C.S., North Hall, Basingstoke.

WANTED, the February and March, 1884, numbers of SCIENCE-GOSSIP. State price or what wanted in exchange.—H. P. FitzGerald, M.C.S., North Hall, Basingstoke.

OFFERED, six vols. of "Knowledge," complete, up to December, 1884, first four bound, and a collection of birds' eggs, in exchange for a good half-inch micro objective and slides.—C. B. Keene, All Saints, Derby.

WANTED, any articles of bric-à-brac, viz., coins, tokens, medals, seals, china, arms, armour, old Roman pottery, flint flakes, or stone or bronze weapons, in exchange for fossils, minerals, stuffed birds, &c.—F. Stanley, Margate.

WANTED, axial crystals, quartz plates, &c., for table polariscope, in exchange for lantern and micro slides.—H. E. Freeman, 60 Plimsoll Road, Finsbury Park, N.

BRITISH and Foreign birds' eggs offered for others not in collection.—Dr. J. T. T. Reed, Ryhope, Durham co.

WILL exchange Goldsmith's "History of the Earth and Animated Nature," 4 vols., with plates, almost as good as new, for manuals of British botany or geology. What offers?—William Lyon, Broomhill Terrace, Keith.

"NATURE," vol. xi.; the first two vols. "Magazine of Art;" also "Knowledge," two vols. of which are bound. Wanted, micro slides in exchange, apparatus, or offers.—H. Moulton, 37 Chancery Lane, London, W.C.

SCIENCE-GOSSIP, complete for 1883 and 1884, unbound. Wanted, Tyndall "On Sound," Wallace's "Natural Selection," or Deschanel's "Physics," vols. i. and ii.—F. R. Tennant, Port Hill, Stoke-on-Trent.

MICROSCOPE slides wanted in exchange for pair of photographs. General Gordon and Colonel Burnaby, coloured in oils on convex glasses, value 10*s*.—Mr. Ebbage, Watton, Norfolk.

VOL. II. "Christian Million," and several "Rare Bits" and "Tit Bits," in exchange for natural history books or apparatus.—Frederick Harding, Shipley House, York Road, Eastbourne.

SHILLING editions of Coleman's "Butterflies," Wood's "Moths," Wood's "Beetles," and the three last numbers of SCIENCE-GOSSIP with plates, will exchange for natural history books or apparatus.—Frederick Harding, Shipley House, York Road, Eastbourne.

A VERY fine and complete collection of fossils from the chalk of Surrey and Kent (specially rich in sharks' palate teeth, both in variety and number) together with a collection of minerals and crystals (including a group of amethyst crystals 40 inches in circumference, and a slab of flexible sandstone) will be exchanged for English coins in fine preservation.—A.B., 97 Burton Road, Stockwell, S.W.

"A LARGE number of shells in duplicate. Wanted, other shells, mounted molluscan palates, and back numbers of scientific journals.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick.

DESIDERATA: *S. oblonga, P. roseum, Vertigos, Acme* marine shells, and vars. of *nemoralis, hortensis*, &c. Duplicates: *Testacella haliotidea, Z. glaber, A. acicula, L. glutinosa, P. pusillum*, &c.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, W.

WANTED fossils, shells, or eggs, in exchange for chalk fossils, nummulites, *Trigonia, Gibbosa*, &c. Also beetles from Peru and Luscor; staghorn, *Necrophorus vestigator*, &c.—M. T. C., Wrasenham Vicarage, Swaffham, Norfolk.

OFFERED for other species, either British or foreign: *H. revelata, Pisana, arbustorum, aspersa* v. *tenuior, P. contecta, L. neritoides, V. verrucosa, H. tuberculata* (Herm), *M. aciculatus, Cl. Rolphii, H. ventrosa*, &c.—B. Tomlin, 59 Liverpool Road, Chester.

WANTED, SCIENCE-GOSSIP for 1884, complete with plates of microscopy, unbound. Offers, quite new: "Among the Wild Flowers," by Rev. H. Wood, or "Wild Flowers, where to find and how to know them," by Spencer Thomson, M.D., L.R.C.S., F.B.S.E., or pressed specimens of two rare centaureas; *C. calcitrapa* and *C. solstitialis*.—Miss E. A., Dadnor, Ross.

BOOKS, ETC., RECEIVED.

"The Worcester County Naturalist" (Mass.).—"Feuille des Jeunes Naturalistes."—"Canadian Science Monthly."—"The American Monthly Microscopical Journal."—"The Naturalist."—"Journal of Conchology."—"Journal of the New York Microscopical Society."—"Science."—"Report of the Entomologist."—"Catalogue of the Exhibit of Economic Entomology." — "Proceedings of the Geologists' Association." — "Canadian Entomologist."—"American Naturalist."—"The Microtomist's Vade-Mecum," by Arthur Bolles Lee (London: J. & A. Churchill).—"Transactions Herts. Nat. Hist. Soc.," vol. iii., parts 3 and 4.—"Report of S. London Entomolog. and Nat. Hist. Soc. for 1884."—"Proceedings of Acad. of Nat. Sciences of Philadelphia."—"Popular Science News."—Proceedings of the Holmesdale Natural History Club," 1881–1883.—"Handbook to the Geology of Shropshire," by J. D. La Touche (London: Ed. Stanford). — "Revista Scientifica" (Porto).

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—C. A. G.—A. S. B.—F. R.—F. H. L.—W. T.—F. M.—F. F.—R. B.—S. F.—J. E. K.—J. B. B.—W. S. S. & Co.—E. H.—J. H. C. R.—E. W. O'M.—W.—E. R. T.—E. P. T.—J. E.—E. B.—J. A.—E. F.—S. J. M'I.—W. P.—A. H. F.—A. A.—W. H.—(H. A. K.)—G. A. B.—C. B.—H. B.—E. T. D.—H. A. W.—F. S.—H. E. F.—B. B.—E. B. L. B.—H. A. F.—H. P. F.—M. E. P.—S. C. L.—G. W. B.—J. A.—F. J. G.—J. R. R.—E. P. T.—A. R. W.—E. A.—B. T.—A. B.—F. H.—J. W. O.—Mr. E.—H. F.—F. M.—D. B.—J. T. T. R.—W. W. B.—W. H. P.—A. A.—C. T. M.—E. C.—M. L. S.—F. R. T.—M. T. C.—G. E. E.—S. C. C.—H. M.—L. M. W.—H. S. W.—J. R.—C. F. F.—H. W. K.—W. L.—C. B. K.—A. M. P.—A. D.—W. K. M.—J. F.—H. L.—Dr. A. B. G.—G. H.—O. P. C.—J. E.—A. D.—H. G. G.—G. E. T.—M. W. N.—C. S.—W. H. H.—T. D. A. C.—H. H.—J. M. C.—W. T.—T. S.—H. M.—C. M.—J. H.—B. B. W.—T. N. K.—&c., &c.

E.T.D. del, ad nat. Vincent Brooks, Day & Son lith.

TRANS. SECTION, SPINE OF SEA URCHIN (ECHINUS)

× 75.

GRAPHIC MICROSCOPY.

By E. T. DRAPER.

No. XVII.—Transverse Section of Spine of Echinus.

THE intimate correlation of parts, and the manifest mechanical perfection of the structures of an Echinus, or sea-urchin, renders the creature peculiarly adapted for interesting and contemplative microscopical investigation; every part has a curious fitness, and expediency may be revealed in all the more important organs; among other features, the character of the nearly globular box, containing the animal, built up of an enormous number of accurately-fitting plates, the calcareous pieces forming the mouth, the five sharp socketed incisor teeth, of great strength, arranged in a circle, and in such a position as to simultaneously close upon, and crush the hard crustaceous substances, or anything that comes in its way, as food; guided to the centre of the mouth by a similar number of interposing osseous processes, with jaws of such complex structure as to establish, with the dental system, a masticatory apparatus, unique in character and adaptability. Supporting this, and enclosing other softer tissues is the "lantern of Aristotle," a framework of five symmetrically curved bones with transverse ties firmly attached to the interior of the box, strengthened by a similar number of elegantly formed pieces rising from the base; all the hard parts are formed on a pentagonal principle, a multiple of five; the whole locked together with mathematical precision; exteriorly, the interest is sustained by the prehensile suckers emerging through multitudinous apertures, and where least expected, a disclosure of rare beauty in the structure of any one of the forest of hard spines with which the creature is completely surrounded; each capable of separate movement. A transverse section of such a spine, ground and polished, is the subject of the plate.

The case, or envelope of an Echinus consists of a somewhat flattened spherical box, made up of many hundred jointed pieces, the whole appearing like a single shell. In some species the texture is light and porous, in others considering the number of parts of exquisite solidity; five pairs of "ambulacral" plates, connected by well-marked sutures, traverse the shell in polar lines. This set of segments is perforated with many apertures for the emergence of prehensile locomotive suckers. Between each is a similar number of rather wider segments, the "interambulacral," accurately fitting the others; on these project a double row of knobs, or tubercles, on which the spines are articulated by a ball and socket joint. All the pieces forming the wonderful box are serrated, and compacted with minute precision, giving great strength; the actual substance of the shell is composed of calcareous material and silicates obtained from the sea, secreted by a soft organic membrane which invests and permeates every fissure. The spines are articulated to the tubercles on small polished nipples seen studding the outside of the interambulacral plates, and vary in form and size according to species; generally they are grooved horizontally.

Vertical cuttings of these organs are interesting; but their true beauty is only disclosed when transverse sections are made, carefully ground and polished to a requisite thinness; and so diversified are the patterns that a collection of many hundred specimens rarely discloses two absolutely alike, differences in appearance and complexity resulting from the position of the cutting, and its distance from the base or the apex; as the spine consists of a series of cones either of overlapping or inter-deposited growths, necessarily a section reveals annular bands in number equal to the cones included in the part where the cutting is

made, colour being affected by the same cause, towards the base generally showing pink or golden, and nearer the harder apex, blue and purple tints.

Some species have hollow spines; such specimens are deeply furrowed longitudinally on the outside, and are generally too large to make perfectly circular sections to fall within a microscopic "field" of view, but delicately cut and ground; segments of such slices display such remarkable elegance and neatness of design, that when carefully illuminated, and the configuration of the parts studied, they at once impress the mind with their adaptability to purposes of artistic decoration. It is possible no class of microscopical presentations can be more suggestive to the designer of geometrical patterns, and under various conditions of light they are materially altered in appearance. Many parts with transmitted light show configuration, and but slight colour or substance; under the radiation of dark ground illumination they become totally different, and flash out exquisite translucent pearly lustres. With the polariscope, especially when the cutting is carefully selected for extreme thinness, but yet preserving the denser parts intact, the beauty is incomparable. Even mounted as purely opaque objects, under the radiance of the side speculum, porcellaneous specimens show a rare delicacy.

A minute examination of one of these sections recalls the rings and medullary rays of the stem of an exogenous tree, and their number and position (as in the tree) depends on the age of the spine and the part from which it is cut. In the centre is an open network slightly divergent, at intervals zones of larger deposits, calcareous tracery intervening, the whole cut up by equidistant structural radiations; illuminated with the paraboloid, what appear to be the larger "spaces," as distinguished from the general intersections, are seen of uniform substance and colour. A spine may be defined as a fluted spur of connective hard pellucid tissue, with interspaces filled with solid glass. Spines of the British Echini have no concentric rings, it is supposed in consequence of periodical shedding, while in tropical species in the course of growth, layers are added. A crushed spine resolves itself into glass-like particles, transparent and brittle. A power of repairing fracture and injury has been observed, the vitality of the spine and its increase in size is maintained through a connective tissue at the base, and although the internal structure is apparently unprovided with vessels, reparation takes place, as long as the animal be living and the injured spine attached; many sections, especially when cut through the length, often reveal such interferences of regularity, obviously the result of injury, and recuperative power.

An attempt was made by the writer to depict, in the second volume of Coles' "Microscopical Studies" (Methods of Research) one of these sections to illustrate appearances under four different modes of illumination. The difficulty in preserving delicate line, with painting effects of colour bathed in light; supplemented by the more limited resources of even the best chromo-lithographer (a condition of things seen in the present subject) reduces such drawings, *when printed*, to mere semblances of the reality; but they offer, at least, sufficient inducement to direct attention to the general elegance found in these most popular of microscopical objects.

Crouch End.

THE VIOLET.

BUY my sweet violet, a penny a bunch! is one of the familiar cries we hear every morning at this time of year (spring) as we hasten to our respective callings in London (and no doubt in other cities as well). It is a most refreshing sight, to any person who has the least spark of the love of nature, to look at the beautiful baskets of button-hole bouquets which meet our eyes in the different streets, but more particularly in the neighbourhood of the Bank of England and Royal Exchange. The city clerk on his way to his office, purchases a bunch of violets—places them on his desk, surrounded with his day-books, ledgers, and all the paraphernalia of a mercantile house: perhaps once or twice during the day, while his mind is engaged on the routine of his daily duties, the delicious perfume from his morning purchase causes him for a few moments to look up at these emblems of modesty and innocence, and awakens a train of thought of the days of his childhood, when he and his companions hunted for the fragrant flower among the green fields and hedgerows in the early spring.

But time flies; work must be finished; no leisure for such meditations; still those few moments have not been spent in vain: his brain has been rested by a change of thought, and he is enabled to go on with his work with fresh energy and vigour. Thanks to the little violet. This flower was held in high estimation by the ancient Greeks. A golden violet was offered as a prize in their floral games, and we are told in their fables that Ia, the daughter of Atlas, fleeing into a wood from the pursuit of Apollo, was through the power of Diana changed into a violet, which still retains the bashful timidity of the nymph, by partly concealing itself from the gaze of Phœbus in its foliage. The Greek name for this flower was Ἴον, said to have been given it because Iov the daughter of Inarchus, whom Jupiter transformed into a heifer, fed upon violets, or, as some mythologists state, sprung from her breath. The Athenians, we know from the writing of Anacharsis, had beautiful gardens attached to their country houses, in which they cultivated the narcissus, hyacinth, iris, and violets of different colours, likewise roses of various kinds. All these flowers were

extensively sold at Athens in a market appropriated for their disposal; even in the cold season violets were to be seen there—for Aristophanes, in his Seasons, speaking of the glories of that luxurious city, says:

> "There you shall at mid winter see
> * * * * * * *
> * wreaths of fragrant violets,
> Covered with dust as if in summer."

Vitruvius, a celebrated writer, who flourished under Julius Cæsar, tells us that the flowers of the violet were not only used to adulterate or counterfeit the celebrated blue of Athens, but were also employed to moderate hunger, to cure ague and inflammation of the lungs, &c., and the blossoms worn as garlands were considered as a charm against falling sickness. The Romans used to put large quantities of violet petals into casks, and cover them with good wine; from this infusion they procured a drink called Violatum, which was only used on festive occasions. The petals of roses were also used in the same fashion, and called Rosaltum. Pliny gives a long list of the virtues of this flower. The ancients believed the seed counteracted the effects of scorpions' stings. The violet has been in all ages a favourite flower, and is recognised by the poets as the emblem of modesty and innocence. Spencer calls it the cool violet, and Shakespeare compares the soft strains of plaintive music to its perfume.

> "That strain again; it had a dying fall.
> O, it came o'er my ear like the sweet sound,
> That breathes upon a bank of violets,
> Stealing and giving odour."—*Twelfth Night.*

And again, the touching remark of Ophelia, who coloured all nature with hues of her own sad thoughts, "I would give you violets, but they withered all when my father died." Milton makes echo dwell amongst violets:

> "Sweet Echo, sweetest nymph that lives unseen,
> By slow Meander's margent green
> And in the violet embroider'd vale."

From Googes' translation of that old work, the Popish Kingdom, we find that the violet was among the flowers used in the ceremony called "creeping to the cross" on Good Friday, and, no doubt, it was present in all the old floral usages of spring in "days gone by." Our old botanist Gerard mentions several kinds of violets in his Herbal, but the sweet violet he says has a great prerogative above all others, for one reason he states, "because they are delightful to look upon, and pleasant to smell too. They also bring to the mind the remembrance of all kinds of virtues. For it would be unseemlie for him that doth look upon and handle faire and beautiful things, and who frequenteth and is conversant in faire and beautiful things to have his mind not faire—but filthee and deformed." In the reign of Charles II. a conserve called violet sugar, or violet plate, was sold by apothecaries, and continually recommended by physicians to their consumptive patients.

This flower has been made the badge of political feeling in France, the violet being the emblem of the liberal party. In 1814 many pictures were circulated in France which appeared to represent merely a bunch of most innocent violets, but a little scrutiny of the shadows cast by the violets enabled any one looking for such a thing to discover portraits of the first Napoleon and his wife and son—(vide "Flower Lore.") The violet was the favourite flower with Napoleon the first; and the Bonapartists, during the banishment of their chief to Elba, while plotting for his return, filled their snuff-boxes with violet-scented snuff, and when offering a pinch would significantly enquire: Do *you* love this perfume? and at the time when he was expected to return to France, they toasted his health under the name of *Caporal Violetta* or the flower that returns with the spring.

Botanically, the violet belongs to the order Violaceæ, which contains about a hundred species spread over the greater part of the globe, but is limited in Europe to the single genus Viola, containing several varieties, as the marsh violet (*V. palustris*), hairy violet (*V. hirta*), dog violet (*V. canina*)—(*V. tricolor*) heart's-ease or pansy—all (except *V. odorata*) with scentless flowers. In all the British violets, except the pansy, the perfect flowers seldom set their fruit; but if a plant is examined during the summer and autumnal months, large capsules, containing fertile seeds, will be found produced by minute flowers almost without petals or stamens.

It was the violet which induced John Bertram, a Quaker of Pennsylvania, and the friend and patron of Alexander Wilson, to study plants. He had employed his time in agricultural pursuits without the knowledge of botany, but one day he gathered a violet, examined its formation, and reflected upon it until he became so prepossessed with the flower that he dreamed of it. This circumstance inspired him with a desire of becoming acquainted with plants, he therefore learned for that purpose as much Latin as was necessary, and soon became the most learned botanist of the new world. The colour extracted from the violet by infusion affords the very delicate test called violet paper used by chemists for acids and alkalies, being reddened by the former, and rendered green by the latter. Syrup of violets is greatly used by confectioners for making confections, candies, &c., also by perfumers for scenting oils, pomades, and making Eau des Violettes. Large quantities of violets used to be cultivated at Stratford-upon-Avon for this purpose. The root, or rather the underground stem, has a strong smell, particularly when dried, and its taste is acrid, bitter and nauseous.

Professor Burkman states, that in some parts of Gloucestershire the violet is considered unlucky to have in the house, the reason alleged being that these flowers "certainly brought in fleas." Probably the warmer weather of spring which ushers in the violet, said to be "a stinking flower" by the foxhunter, causes the troublesome little insect to be hatched.

Violets are cultivated on a large scale round London, at Twickenham, Strawberry Hill, Richmond, and other places on the banks of the Thames. They are usually grown under orchard trees, a position in which they thrive remarkably well. They are also grown in large quantities in some parts of Kent, Surrey and Sussex, Pevensey, &c. Violet culture is said to be a most lucrative industry.

HAMPDEN G. GLASSPOOLE.

NOTES ON NEW BOOKS.

A *BIBLIOGRAPHY, Guide, and Index to Climate*, by Alexander Ramsay, F.G.S. (London: W. S. Sonnenschein & Co.). This is in reality a magazine of systematic notes relating to climate, with digests of papers and books, &c., on the subject. The volume exhibits immense industry and research, and the student will save much time by using it as a reference book.

Edible British Mollusca, by M. S. Lovell (London: L. Reeve & Co.). The second edition of this nicely got-up book has appeared, illustrated by beautiful coloured plates, and containing a large number of recipes for cooking all our natural mollusca. The reader will be astonished to find what a number of recipes are available. There is a good deal of quaint reading in the work, and altogether it is one unique in this department of literature.

A Handbook of the Geology of Shropshire, by J. D. La Touche (London: Edward Stanford). Mr. La Touche is well known as a field geologist and ardent worker with the hammer, and he has laid all British students under obligation by bringing out this compendious little handbook of the geology of perhaps the most interesting geological county in Great Britain. It is a digest of all that is good and useful from "Siluria" to the last published paper of Callaway, Lapworth, Hopkinson, Maw, and others, besides the author's own original observations; and it is illustrated by twenty lithographed plates, containing above 700 figures of fossils from the Cambrian to the Old Red Sandstone inclusive.

The Microtomist's Vade Mecum, by Arthur Bolles Lee (London: J. & A. Churchill). This is a valuable book, especially to medical students who are diligent in the use of the microscope, as it describes all the methods of microscopic anatomy. It is intended, however, more for the instructed anatomist than the beginner, and therefore country doctors who wish to keep their "hand in" work they always loved, but have found little time to continue, will hail this little work with pleasure.

The Collector's Manual of British Land and Fresh-water Shells, by Lionel E. Adams (London: George Bell & Sons). A beautifully got-up little manual, with exquisitely engraved figures of every British species. Perhaps no department of natural history has come more to the front lately than that of land and fresh-water mollusca. Mr. Adams is well known as a conchologist, and he therefore knows what he is writing about. Moreover, he also knows how to present his knowledge in a useful form. The present work, besides describing every species, its habits, localities, &c., gives an account of all the varieties, hints on arranging and preserving shells, &c.

FERTILISATION OF *ORCHIS MASCULA*.

By EDWARD MALAN.

IN a back number of SCIENCE-GOSSIP (Aug. 1883, p. 181), your correspondent G. M. pointed out some errors into which I had fallen with respect to the fertilisation of *O. mascula*, and, when, in a subsequent number (Nov. 1883, p. 249), I asked him to favour me with his address, he did so at once with the utmost courtesy.

To this day, shame on me, he has received neither thanks, answer, nor recognition of any sort.

But I have not been idle, meantime, and if G. M. will read what I now have to say, he will see, and, I trust, accept the reasons for my lengthened silence. The reasons are two. I waited in hopes that some one would reply to his remarks, for here and there he has not quoted my words quite correctly; and I wanted to make further observations, by way of verifying my statements. *Quod feci.*

First of all, as regards the quotation from Mr. Darwin's book, it was not, of course, given word for word. It wasn't meant to be given word for word, and I thought that the absence of inverted commas would show as much, but I see now that my version is different in words and substance from the original. I am exceedingly obliged to G. M. for correcting me. I will be more careful in future.

I do not think, however, that my remark about the *viscid drop*, which exudes directly the *rostellum* is touched, is altogether wrong. At any rate there is no inaccuracy or confusion in what I said. A viscid drop does exude. I have seen it do so frequently. For instance, a viscid drop almost invariably exudes when the air is dry and the sun shining. Then, for some reason, the *pollinia* are not inclined to adhere, and bees, as if aware of this, scarcely deign to visit the spikes on fine days. I have fertilised literally scores of orchis flowers in Mr. Darwin's own way, i.e. with a pencil, and repeatedly a tiny drop of milky fluid has remained on the point of the pencil, without either *pollinium* becoming detached. Therefore please observe that I did not use the expression *explosion*, nor did I say *a pollinia*. By *explosion*, I presume, a *forcible expulsion* is intended. This will not apply to *O. mascula*. I have, also, on very many occasions, watched with great delight the drop

shoot out from the flower of *Listera ovata* and *Neottia Nidus-Avis* and once, while fertilising a spike of *Spiranthes autumnalis*, the flowers behaved in the same way, though not with such force. Besides, my statement is so easily proved or refuted. Let only anyone go out this lovely May day, and make the experiment with a spike of *O. mascula*, and, provided the sun is shining and the air dry, I believe a viscid drop will exude. For it must be remembered that a warm cloudy morning is necessary to enable the *pollinia* to escape freely, and indeed it is only on such a morning that I have ever seen humble-bees visiting the plant. Thus the chances of *O. mascula* being fertilised by humble-bees in the legitimate way are very often narrowed down to an extremely small margin.

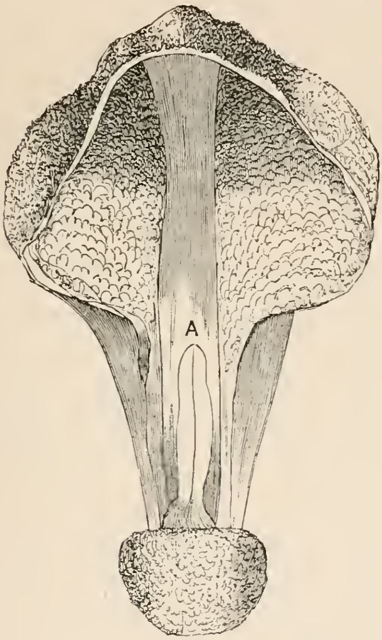


Fig. 66.—Anthers of *Orchis mascula*.

Next, as to the *lip* or *pouch* which covers the viscid balls attached to the base of the *pollinia*. In the spring of 1882, I made this drawing of the *anthers* of *O. mascula*, and I think it is correct. I had it by me in 1883, when I wrote my paper, but I forebore from describing it, as I had already sent in too many diagrams, and there were the plates also in Mr. Darwin's book. I should like to make a few remarks about it now.

To my mind, and probably to the minds of those who examine the drawing attentively, the most wonderful part of this most wonderful piece of mechanism, is the central strap-like process arising from and attached to the rim of the *pouch*, and passing between the enclosed *caudicles* of the *pollinia*, until its end is on a level with the *pollen-masses* themselves, concealed from view. For want of some name I will call this process the *thong*. This *thong*, then, is the wonder of the whole. While drawing it (May 1, 1882), I was entirely at a loss to account for its use, but subsequently it dawned on me. As far as I understand its economy at present, it seems to be attached at its upper end, something like the tongue of a frog, and, apparently, for the same reason. It is highly elastic and retractile. I do not observe that G. M. notices it. He says "should the pouch be depressed without the pollinia being removed, it rises and protects the viscid balls; or if only one be removed, it rises and protects the other." Exactly so: but why? The pouch rises and returns to its place, I believe, because of this elastic *thong*, but not of its own accord. And further, I believe that this *thong* is expressly intended to prevent the removal of both *pollinia* at once, which it certainly often does do, for the humble-bee becomes quarrelsome when two *pollinia* are attached to his forehead, and tries to rub them off. This I have witnessed. One single *pollinium*, on the contrary, appears to cause little or no inconvenience. If this is a fact, it is a very interesting and marvellous one.

Fig. 67.—Pollinium of *Orchis mascula*.

Then G. M. finds my description of the drying of the *viscid disc* rather misleading. Here is a drawing of a *pollinium* made on May 12, 1883. It is the most perfect one I have been able to observe

Notice the superb symmetry of its proportion, Notice particularly the *viscid disc*, and the way the *caudicle* is attached to it. Now, whether the *viscid disc* as a whole dries or not, seems to me a little beside the question. Perhaps it does, and perhaps it does not. I am not evading the question, but I prefer to ask how it would be possible to maintain such a structure as this *pollinium* perfectly rigid and in a perfectly upright position for 30 seconds even, without some depression taking place? How would it be possible even on an immovable basis? How would it be possible in architecture? Let us take an instance. A Greek column, the ideal of simplicity and strength, tapers towards the capital and thickens towards the base. The thickening occurs at one-third of the distance from the base, as being the weakest point. Experiment with a roll of moist clay. The construction, therefore, of this *pollinium* must evidently induce rather than prevent a subsidence, and the drying of the *viscid disc* can only assist in a secondary degree. What actually does occur during the operation of fertilisation is this. The humble-bee alights on the *labellum* and cranes his serviceable head well forward, in order to sweep the base of the *nectary* in a horizontal manner with his proboscis, so that when he withdraws his head, with a *pollinium* attached, the *pollinium* projects from his forehead, not at all in an upright position, but nearly at right angles. Why a forward movement of depression is bound to occur! and even without the depression, the pollen-mass would strike on the stigma, only there would not be the same chance of leaving so much pollen. I trust this is plain now, but I trust also that G. M. will observe and consider for himself.

While touching on this subject, I wish to draw attention to another delightful piece of intentional adaptation. If, as I have just supposed, the *thong* retains the pouch in its proper position, then a mere forward thrusting movement on the part of the bee will not be sufficient to disengage the *pollinia*, a fact which I have often proved with the pencil; but a horizontal movement from side to side will be necessary, or a rotatory movement of the pencil, which amounts to the same thing. Now do please notice the shape of the *nectary* (SCIENCE-GOSSIP, April 1883, p. 76), widened as it is towards its end, like the mandibles of a spoonbill's beak, and do please tell me what it is for, if it is not to allow of the horizontal movement of the bee's proboscis? Perhaps you will object that the *nectary* is not widened throughout. I anticipated that objection on Aug. 22, 1884, by securing the proboscis of a dead bumble-bee, and I found that it resembled a spear, with the shaft thickened at the base and tapering till it joined the head. The head was nearly $\frac{1}{8}$ inch long, and the shaft $\frac{5}{8}$ inch long (i.e. the head was $\frac{1}{6}$ of the whole length), and when compared with the length and shape of the *nectary*, the adaptation was so remarkable as to compel outspoken admiration. The *nectary* formed a case for the proboscis as if made to measure! Then, to assure myself of my theory, I took a fly-rod, and removing the top-joint, and holding the thicker end so as to give the remaining 9 ft. a gentle free horizontal motion, I observed the airy delineations and peculiar shape the rod took. Well, it was, of course, something like a flat paint-brush, the minimum of the sweep being at about 2 ft. 6 in. from the tip (i.e. $\frac{1}{4}$ of the whole, nearly). This was a most singularly faithful representation of the bee's proboscis, and the reason of the spear-like shape at once became apparent. Really this is worth close observance.

(*To be continued.*)

GOSSIP ON CURRENT TOPICS.

By W. MATTIEU WILLIAMS, F.R.A.S., F.C.S.

THE Editor of "The Popular Science Monthly" (New York) says "Harvard University is to be congratulated on its leadership in the important work of liberalising the traditional college education." This refers to a reform of the practice of forcing modern students, whatever their ultimate aim may be, to waste their time and degrade their intellects by the tedious and shallow cramming of memory with those dead languages which constitute the sole attainments of the dominating pedagogues, whose vested interests and monkish inheritance our universities are still constructed to uphold. The University of Harvard is a great and growing university, its degrees are justly honoured everywhere. What then will follow?

Simply the natural operation of the laws of supply and demand. A trip across the ocean is a trifling exploit now-a-days, and in itself an almost necessary element of a truly liberal education. Therefore, if Harvard continues moving in this direction faster than our universities the practical British parent, who is now groaning with disgust at the intolerable impediments that are placed on the threshold of our academies, will simply send his son where he can obtain what he requires; the useful and truly elevating culture of scientific education, without the preliminary penalty of learning what every sensible man contemptuously forgets, as soon as he enters upon the practical business of life. This competition will tell most powerfully on the non-clerical universities. Oxford and Cambridge will not for a long time be sensibly affected by it, but the London University and others which, like it, were intended by their founders to supply modern and secular requirements, may suffer seriously and soon. They will lose the students they can least afford to spare, viz. those endowed with the higher intellectual powers demanded by science, and who consequently

despise the prevailing exaltation of mere linguistic grindery.

In the same magazine is a letter from Mr. E. C. Mason, of Madison, Wisconsin, stating a fact which refutes the widely prevalent notion—I may almost say superstition—that many of the lower animals are endowed with marvellous powers of predicting the far-ahead weather. In America the musk rat is one of these supposed meteorologists. It is there believed that when he builds his winter quarters lightly, he does so because he is inspired with foreknowledge of a mild coming winter. Last autumn, the musk rats of Wisconsin built their houses "exceptionally light and unsubstantial." The winter was severe, and the rats perished exceptionally. The actual reason for the flimsy building was that the autumn was unusually mild, and the rats simply adapted their present proceedings to present weather.

This American delusion, however, is a very mild one compared with that which still prevails here, concerning the complex intelligence, foresight and benevolence of the holly, which is seriously credited with developing an extra supply of berries on the approach of a hard winter, in order that the birds, especially sparrows, shall be provided with food when the snow covers the ground.

I need scarcely add that anybody who knows how to observe facts accurately, and record them fairly, may refute this absurdity. The development of the berries, like the proceeding of the rats, is a result of past and present weather, with possibly some other past and present conditions co-operating.

Before closing the above quoted magazine, I must borrow from it an amusing story of medical evidence, given in a trial for damages. A physician, called as witness, stated that the plaintiff was suffering from the remote effects of an injury to the vaso-motor system of nerves, and would in time become insane. In cross examination, the doctor was asked whether he was acquainted with the works of Grosse "On Recent and Remote Effects of Head Injuries," Lanery on "Injuries of the Head," Leymaher "On the Subsequent Effects of Nervous Shock," and Carson "On the Surgery of the Head." The doctor affirmed that he had read these books, and that his library contained them all. The opposing counsel then called to the witness box a clerk from his office, who testified that all these works were fictitious, and that he had invented the titles in order to expose the doctor's ignorance.

The ruling machine of Nobert is now in London, has been purchased by Mr. Frank Crisp, and was exhibited at a recent meeting of the Royal Microscopical Society. I remember when a micrometer slide for a microscope ruled to $\frac{1}{1000}$ of an inch was an object of curiosity, and rather costly. With Nobert's machine $\frac{1}{112000}$ of an inch is attainable. Remembering that the divisions of $\frac{1}{1000}$ gave to the strip of glass the appearance of being ground where they crossed, the lines and spaces being separately invisible to the naked eye, this exploit of dividing the invisible divisions into 112 parts appears impossible. The difficulty does not consist in moving the point, or stage holding the glass, accurately through the small distance. An ordinary driving engine constructed on the principle of those of Ramsden and Parsons, which were in active operation 50 and 60 years ago, does this easily, but the two other necessary elements, a point sufficiently fine to cut a line less than $\frac{1}{100000}$ of an inch thick, and a surface of glass capable of receiving such a cut presented problems which Nobert overcame. The cutting point was of course that of a diamond, worked to a knife-edge, either by grinding, or chipping, or slitting.

Everybody has read of the wondrous rapidity of the growth of Arctic vegetation. Now that summer excursions round the North Cape to the Varanger-fjord are running weekly and even oftener (see "Belgravia" of June last) anybody who has a month's holiday at about midsummer may witness it and see the midnight sun, &c., at less cost than spending the time in English hotels. On my first visit to Norway, Hammerfest was the *ultima thule* of steam packets, but even on this short journey, the difference between the aspect of the country, in the course of ten days between going and returning was marvellous, though I did not repeat the experiment of the American tourist who tells us that by placing his head on the ground he could *hear* the grass growing. Not only is the vegetation stimulated to excessive rapidity by the continuous daylight, but the leaves and seeds of the plants are larger and heavier. Schübeler has lately analysed these larger seeds (see Biedermann's "Centralblatt für Agricultur u. Chemie," 1884, p. 860), and finds that the extra weight is not due to nitrogenous matter, as this remains unaltered. Plants that produce white blossoms in other places frequently have violet flowers here. Perfumes are remarkably developed.

The best time for witnessing the rapidity of vegetation in Arctic Norway, is about the first week of July. Starting from Trondhjem, on, or a little before, the first of the month, the northward trip displays snowclad regions, which on the return journey a fortnight later have become so transformed as to be difficult of recognition.

A very simple method of testing the quality of compressed or "German" yeast, is given by O. Meyer (Biedermann's "Centralblatt," 1874, p. 792). A small piece of the yeast is placed in water at the temperature of 25° Cent. (77° of our thermometers). If the yeast is in good active condition it will rise to the surface in one and a half to two minutes, if of poorer quality, in about five minutes. Bad yeast will not rise at all.

Having devoted a whole chapter of my "Chemistry of Cookery" to the subject of "malted food," which until I wrote about it in "Knowledge" had been

sadly neglected, I am glad to see that its importance is becoming recognised by "the faculty." In the "Lancet" of April 4th, Dr. J. Milner Fothergill commences a communication on the subject by saying that "Malt as food has a great future before it." So said I, and further practical study of the subject not only confirms my original expectations, but greatly extends them. Dr. Fothergill naturally looks upon the subject from a physician's point of view, and describes the value of malt flour as a supplement to the food of dyspeptic patients. I am by no means a dyspeptic, quite the contrary, troubled with over-nutrition and its bulky consequences, but nevertheless I have found the use of malt as an addition to every kind of food containing farinaceous matter very advantageous, and am receiving communications of gratitude from strangers who have followed my advice given in "Knowledge," and repeated in the volume above named.

So much having been said concerning the value of malt as cattle food during the agitation for the repeal of the malt tax, we might have supposed that human beings should have been considered at the same time, but instead of this the idea of using it ourselves is almost a new one. The cost has shut out the cattle, but it need not exclude us, though I am sorry to say that the price I have had to pay for malt flour hitherto is simply ridiculous. It is at present regarded by vendors as a fancy article, and retailed at perfumery rates of profit. This, I hope, will right itself by the wholesome operation of competition when it takes its place as a primary kitchen requisite. I have already brandished a rod of terror in the face of one shop-keeper. I have threatened him with William Whiteley and the Stores.

Another difficulty is kitchen prejudice. My pet experiment for demonstrating the "potential energy" resident in malt is to make a portion of oatmeal very thick or pudding-like; then to add a spoonful of dry malt flour to this at the temperature of about 140° to 150°, and stir the mixture, when, lo, presto! the thick pudding, instead of further thickening by the dry addition, gradually becomes thinner and thinner till quite sloppy. This effect, so much like that produced by adding water is naturally supposed by the orthodox cook to be of the same nature; a dilution or "taking out the goodness." When cooks are sufficiently educated to understand that all their farinaceous thickenings must be reduced to watery solutions before doing the work of nutrition, they will appreciate the importance of performing this necessary first stage of digestion in the kitchen.

I have recently made an interesting visit to the works of Messrs. Burrowes & Wellcome, where "malt extract" is prepared on a large scale, by boiling an infusion of malt in vacuo, so as to extract and concentrate the diastase. The result is a honey-like syrup of maltose, &c., the resemblance of which to the honey of a Swiss breakfast-table has suggested another simple mode of obtaining malted food. I spread it like honey or jam on bread or toast, with or without previous buttering. A very thin film is sufficient to supplement the work of the salivary glands in the manner described in the book above named. To those who take hurried breakfast, and rush off to business immediately after, this is a matter of vital importance, however robust they may be at present. To supply this and other similar every-day domestic demands, the extract of malt must become much cheaper than it is now, as it probably will, when it becomes a grocery commodity demanded by the hogshead like sugar, instead of a pharmaceutical product supplied in bottles.

I attended the lecture of Mr. Fletcher at the Parkes Museum. His object was to show that we may, if we choose, do away with the nasty practice of burning coal in dwelling houses, and thereby not only griming everything indoors, but also rendering our towns and cities hideous by smoke and brown fogs. This is to be effected by using gas fuel for all domestic purposes. If the gas companies were compelled, as they may be, to fulfil the conditions of their charters by supplying the public with gas at cost price, plus the maximum profit allowed by their charter, this wholesale reform might be effected with a considerable economy. Mr. Fletcher showed us that not only domestic heating may be economically effected by gas, but that bakeries, manufactories, &c. may be similarly served by means of gas, plus gas-coke. He has proved by practical experiment in his own works, that with a properly constructed furnace, a steam boiler of the cheapest form may be made to do better duty with coke, and last much longer, than the complex and more expensive boilers fired in the usual manner with flaming coal. But the coke must be mixed with brains. The users must understand that the coke fire does its work by radiation almost entirely, while the flame acts chiefly by convection. Therefore, the furnace must be modified accordingly. It was evident from Mr. Fletcher's description of his furnace that its efficiency depended on this principle, though he did not thus explain its rationale.

SOME FERNS OF HONG-KONG.

By Mrs. E. L. O' Malley.

A SHORT account of some of the Hong-Kong ferns may be interesting to the general reader. There are few persons who take no notice of the works of nature, and the study of ferns constitutes one of the simplest branches of natural science. The material for such a study meets us everywhere, and there is hardly a corner in the world where ferns are not found. In the northern regions beyond the Amur, in Scandinavia, and amidst the snows and long winters of Labrador ferns flourish, when flowers can only show their tender tints and disappear.

Countries subject at times to extreme cold and long drought are the least favourable to their growth. In the temperate zones they abound everywhere; but it is in the deep shade of tropical forests, where the air is densely saturated with moisture, and the sun's rays can never penetrate, that these exquisite plants luxuriate most freely. Nay, if we go back to the beginning of creation, before flowers, before trees, long before animal life had commenced, we find ferns and their allies, the club-mosses (Lycopodiaceæ)

Fig. 68.—*Lygodium Japonicum*, Sw. (Fertile.)

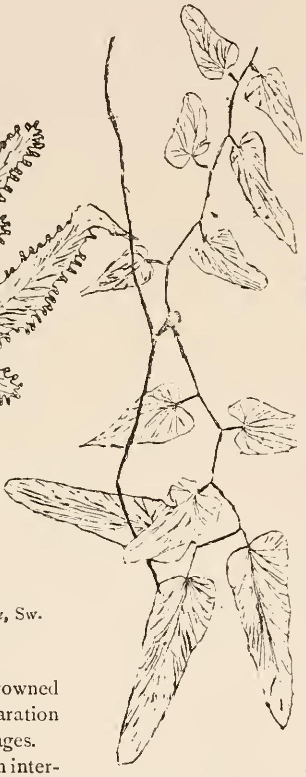


Fig. 69.—*Lygodium scandens*, Sw.

covering the almost drowned world in strange preparation for the wants of future ages.

Can we fail to take an interest in them? And can our interest be satisfied until we have bestowed some attention upon the structure and classification of the different species we meet with in our daily walks?

The following notes may be of assistance to those who wish to know something about the common ferns growing in the neighbourhood of Victoria and the Peak.

Gen. I. Osmunda, Linn.

(*O. Javanica*, Blume.)

The species we shall find in many water-courses and along the banks of rocky streams (some of them we fear "fragrant" no longer,* at least not deliciously so), cannot be compared in point of size and grandeur with our king of British ferns, *O. regalis*. But there are sufficient points of resemblance for any acquainted with one, to recognise the other. The clusters of spore-cases occupy the centre of the frond, narrowing and altering it in appearance. The frond is simply pinnate, and often deeply serrate, usually from 2–3 feet high. The colour is bright green with a firm, shiny, erect appearance, differing in this from the

Fig. 70.—*Gleichenia dichotoma*, Willd.

herbaceous texture and golden-brown tints of *O. regalis*, and the veins are light-coloured and distinct, especially when the plant is young.

Gen. II. Lygodium, Sw.

(*Creeping or Climbing Fern.*)

There are three species of lygodium to be found in Hong-Kong, but in *Lygodium Japonicum*, Sw., we have the commonest, if not the loveliest, fern in the island. Examine the sori all round the edge, like the joints of a cog-wheel. How beautifully the seed-coverings are plaited, or laid like the tiles of a roof one upon the other, each tiny tenement containing one capsule or spore-case, which in its turn holds numerous spores (or seeds), almost invisible to the naked eye! The leaves are either in pairs or else pinnate (i.e. with pinnæ or plumes like a feather), the segments or divisions of the frond often numbering from 5–10. There is no need to say that this fern is a climber. It creeps up anything it can catch hold of, and often attains in this way to a considerable

* The name Hong-Kong in Chinese means "Land of fragrant streams."

height. A word about it in other lands may perhaps be interesting. Miss Gordon Cumming says: "Loveliest of all are the delicate climbing ferns, the tender leaves of which, some richly fringed with seed, hang mid-air in long hair-like trails, or else, drooping in festoons, climb from tree to tree, forming a perfect net-work of loveliness. It is a most fairy-like foliage, and people show their reverence for its beauty by calling it the Wa-Kalon, or God's Fern."* For superstitious reasons also the natives encourage it to grow up their walls and door posts. *Lygodium Japonicum* has a pinnate frond; in *L. scandens*, Sw., the divisions are in pairs, broad at the base and narrowing to a rounded apex, and of a more delicate texture than the last, not nearly so common. *L. dichotomum*, Sw., has fronds 8–10 inches long.

Gen. III. Gleichenia, Sw.

(*Called in some places "Comb Fern."*)

Gleichenia dichotoma, Willd., is abundant, not only in Hong-Kong where it is cut down for bedding for cattle, but in the tropics all round the world. If it were not for its trailing propensities, it might be compared to the brake of our native land; it is also not unlike this fern in roughness of texture, although quite apart in the position which by the formation of its seed it holds in fern-classification. The spore-cases have no covering, but are lightly set in a white flour-like substance in loose groups of 2, 3, 4, or 5, under the leaf. The fern is not very often met with in seed. The arrangement of the long, stiff, pinnate leaves is an easy distinguishing feature, as they grow in pairs, or forked (hence the name di-chotoma, 2 cleft), each fork resulting in another fork and so on, until the long straggling branches form in some countries an impenetrable jungle, too thick for a horse to break through, and mounting 6, 8, or 10 feet high on boughs of trees, low shrubs and underwood. It has been called the "Comb Fern," as the leaves when dry are stiff and like the teeth of a comb.

(*To be continued.*)

For some years past, attempts have been made (without much success) to acclimatise the tea plant in Italy. The Italian Minister of Agriculture has determined to act upon the suggestions of Professor Beccari, who has been investigating the subject, and to procure some plants from the coldest provinces of Japan, as well as some from the province of Novara in Italy. The *Thea Sinensis* has been grown to some extent in the open in Italy, and Professor Beccari thinks there is no reason why tea should not succeed there, under proper management in procuring plants and seeds and in the conditions under which they are cultivated.

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* "At Home in Fiji," by Miss G. Cumming.

CHAPTERS ON FOSSIL SHARKS AND RAYS.

By Arthur Smith Woodward,
of the British Museum (Natural History).

IV.

Cestraciontidæ.

Until quite recent years, the family of Cestraciontidæ was regarded as including all the varied forms now grouped under the Orodontidæ, Psammodontidæ, Copodontidæ, Cochliodontidæ, and Petalodontidæ, and thus its zoological and palæontological signification has been considerably altered of late. The most modern researches seem to show that *Acrodus* and *Strophodus* are the only important extinct genera that can be referred to it with certainty, but *Ptychodus* is also placed here by most palæontoists, although it appears much more nearly allied the Rays, judging from the little that is known about the arrangement of its teeth.

Reference has already been made to the dentition of *Cestracion*, the only existing genus of this family, in the account of the Cochliodonts (vol. xx. p. 270). The diagram (fig. 71), however, will give a more correct idea of the aspect of the jaw: there is much more variation in the dental forms in different parts of the mouth than is to be observed among those sharks with laniary teeth, such as the Carchariidæ and Lamnidæ, and the hindermost are adapted for crushing food, while those at the symphysis are distinctly conical and prehensile. Several rows are in function at a time. It is a noteworthy fact, also, that *Cestracion* has defensive weapons in the form of dorsal fin-spines, while the members of the families just alluded to are destitute of these, their sharp piercing teeth being a sufficiently formidable armature. Only four species of *Cestracion* are described by Dr. Günther, in his British Museum Catalogue, living off the coasts of Japan, Australia, California, and the Galapagos Isles, and no undoubted fossil remains of the genus have hitherto been recorded.

As in the case of *Hybodus*, all the more perfect specimens revealing the structural characters of *Acrodus* have been obtained from the Lower Lias of Lyme Regis. There have been discovered some beautiful examples exhibiting the arrangement of the dentition, others showing the two dorsal spines in association with scattered teeth, and others indicating that this genus possessed the four remarkable cephalic spines so characteristic of nearly all, if not all, the species of *Hybodus*. The most typical teeth of *Acrodus* (fig. 73) are distinctly of the Cestraciont form, and usually differ considerably from those occupying similar positions in the mouth of *Hybodus*, being quite flat or only slightly rounded, and ornamented with very fine ridges and furrows radiating from a more or less central longitudinal line; the dentition of this genus, too, varies more on different parts of

the jaw than in the typical species of *Hybodus*, and there are some dissimilarities in microscopical structure. The symphysial teeth approach a conical form, and there is sometimes a slight indication of lateral or secondary cones. It must be remarked, however, that some species, such as *A. Anningiæ* (fig. 84), are quite on the borders of the two genera, and the ornamentation on a few of even the most characteristic Acrodont teeth (fig. 74) is suggestive of their close relationship to those of the true Hybodont type.

The dorsal spines of *Acrodus*, unknown to Agassiz, were first described in the "Geological Magazine,"* twenty years ago, by Mr. E. C. H. Day. In this elaborate paper, he points out how nearly they resemble those of *Hybodus*, and is unable to discover more than two points of difference between them. He endeavours to show that, in spines of the latter genus, the double row of posterior denticles is fixed upon a somewhat prominent ridge, as seen in the section (fig. 75), while in *Acrodus*, the back of the spine is comparatively flat (fig. 76); also, that the denticles themselves are fewer and stouter in *Acrodus*, than in *Hybodus*. But it must be remembered that, since the date of these studies, much more valuable material has accumulated, and it is questionable whether, when a large number of specimens, such as are now available, are examined, many intermediate gradations will not be found. The object of Mr. Day's paper is, indeed, to prove that *Hybodus* and *Acrodus* are closely allied, and that the only differences between them are merely in degree and not in kind; and he concludes a very careful discussion of their characters by suggesting that, according to their dentition, the Hybodonts and Acrodonts might be regarded as forming a single group, divisible into three sections:—"the first, with very elongated cones, represented by *H. basanus*; the second, with the cones more obtuse, by *H. Delabechei*; and the third, almost or altogether wanting conical elevations, by *A. nobilis*." How far these conclusions are to be accepted, future research must decide.

Species of *Acrodus* range from the Triassic to the Upper Cretaceous strata, inclusive. The Continental Muschelkalk has yielded *A. Gaillardoti* and others, and the Rhætic of Devonshire is characterised by the little *A. minimus* (fig. 77). *A. nobilis* (fig. 73) and *A. Anningiæ* (fig. 84) are the most important species of the Lias, being found chiefly in the lower divisions, and not so abundantly as the remains of *Hybodus*. *A. leiodus* and *A. leiopleurus* occur in the Stonesfield Slate; and two species, *A. Illingworthi* and *A. cretaceus*, have been described† from the English chalk.

The genus *Strophodus* is not quite so well known as that just considered. No certain information has hitherto been obtained concerning any feature in its organisation beyond the dentition,* and only one specimen affording a definite clue to the arrangement of the teeth appears to be yet known to science. This beautiful example is preserved in the Oolitic Caen Stone, and was described by Sir Richard Owen in the "Geological Magazine" for 1869. It exhibits about sixty teeth *in situ*, and is represented in fig. 72. As regards the arrangement of the different dental forms, it bears a close resemblance to the jaw of *Cestracion*, but differs from the living genus in the same respect as does the jaw of *Acrodus*, namely, in the symphysial teeth being much fewer and relatively larger. There are two principal rows of crushing teeth (fig. 72, *a*, *b*), as in *Cestracion*, and there are likewise indications of some posterior rows of smaller and somewhat elliptical teeth (*ib.*, *c*); but, instead of nine rows occupying the space in front of the principal series on each side, only three are to be observed (*ib.*, *b*, *c*, *d*), and no median azygous row is present. The teeth themselves, when isolated, are readily distinguished from those of *Acrodus* by means of their surface-ornament, which consists of reticulate markings, but a glance at the figure of the Caen specimen is sufficient to show the extreme difficulty of determining the species of such detached fossils.

Strophodus ranges from the Upper Permian to the Chalk, inclusive. It is represented in the Kupferschiefer of Germany by *S. arcuatus*, and at least one species is also found in the Triassic Muschelkalk. *S. magnus* is characteristic of the Lower Oolites, and other so-called species (*S. tenuis*, &c.) likewise occur upon the same horizon; *S. favosus* is the name of some small teeth (fig. 78) from Stonesfield. The Middle and Upper Oolites,—particularly the Oxford and Kimmeridge Clays,—yield the well-marked form, *S. reticulatus* (fig. 79), which is easily recognised by the prominence of its ornamentation: of this species we know more than any other, except *S. medius* (fig. 72), a large number of teeth having been found associated in the Kimmeridge Clay of Shotover, and described by Agassiz in his great work on the "Poissons Fossiles." The Cretaceous series contains the last traces of the genus, so far as is yet known, and only two forms appear to have been recorded from this group; one is *S. sulcatus*, from the Greensand of Maidstone, and the other the very rare and curious *S. asper* (fig. 80) of the Chalk.

Ptychodus is an essentially Cretaceous genus, and has not hitherto been met with in rocks of any other age, either in the Old or New World. Nothing beyond the dentition is known with certainty, although Agassiz, in his original description of this shark, associated with the teeth certain peculiar elongated fossils which he thought might be the

* "Geol. Mag.," 1864, vol. i. pp. 57–65.
† Dixon's "Geology of Sussex," 1st edit., 1850, p. 364.

* It has been suggested that the spines known under the name of *Asteracanthus* really belong to *Strophodus*; but absolute proof is at present wanting, and we shall thus reserve their consideration for the chapter on "Ichthyodorulites."

dorsal fin-spines. More recent discoveries in America have proved the identification of the latter to be incorrect, and Prof. Cope has shown that the remains in question are the fin-rays of Teleostean fishes, which he places in a family under the name of Pelecopteridæ.

specific characters and arrangement in the mouth. Species may generally be founded, with a considerable approach to accuracy, upon detached teeth, from a consideration of the ornament of the crushing surface; this has been proved by the discovery of numerous large groups (each evidently the remains

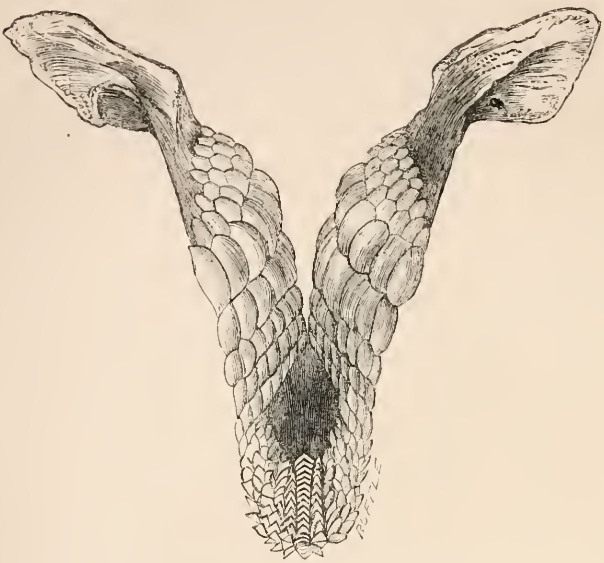


Fig. 71.—Jaw of recent *Cestracion Philippi*

Fig. 73.—Tooth of *Acrodus nobilis.*

Fig. 74.—Ornamentation of tooth of *Acrodus nobilis.*

Fig. 75.—Transverse section of spine of *Hybodus.*

Fig. 76.—Transverse section of spine of *Acrodus.*

Fig. 72.—Jaw of *Strophodus medius.* (After Owen.)

Fig. 77.—Tooth of *Acrodus minimus.*

Fig. 78.—Tooth of *Strophodus favosus.*

Fig. 79.—Tooth of *Strophodus reticulatus.*

Fig. 80.—Tooth of *Strophodus asper.*

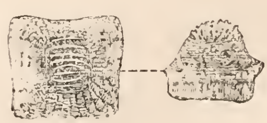


Fig. 81.—Tooth of *Ptychodus mammillaris.*

As the teeth of *Ptychodus* are so well known to all acquainted with the fossils of the Chalk, it is unnecessary to describe their general shape in detail here, and reference need only be made to their

of a single mouth), in which all the forms may be easily recognised as modifications of a single type. About ten species occur in the English Chalk, and of these the commonest are *P. decurrens*, *P. polygyrus*,

and *P. mammillaris*. The first has the central part of the tooth not much raised, with the transverse ridges all insensibly merging into the surrounding granulated area; in the second (fig. 82), the transverse ridges and furrows are coarser and mostly bend round on reaching the granulated area, producing gyrations suggestive of the specific name; in the third (fig. 81), the central part of the tooth is raised into a more or less prominent dome, and the surrounding granulated area is characterised by the delicacy of the markings, and the frequent presence of radiating grooves.

With regard to the disposition of the teeth in the mouth, very little as yet has been ascertained, owing to the fragmentary nature of most of the fossils; so much is known, however, as is represented in the diagrammatic plan (fig. 83), which embodies the information afforded by specimens exhibited in the British Museum. To whichever jaw this dental armature belonged, its arrangement is obviously very different from that of *Cestracion*, and if we were now venturing upon innovations, instead of simply recording the present state of this branch of Palæontology, we should remove *Ptychodus* altogether from the Cestraciont family, and endeavour to find a place for it in proximity to some of the Rays.

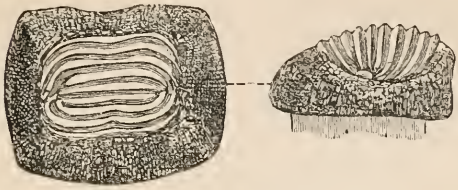


Fig. 82.—Tooth of *Ptychodus polygyrus*.

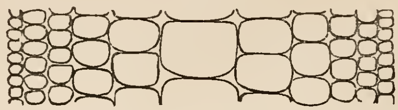


Fig. 83.—Diagram illustrating arrangement of dentition of *Ptychodus*.

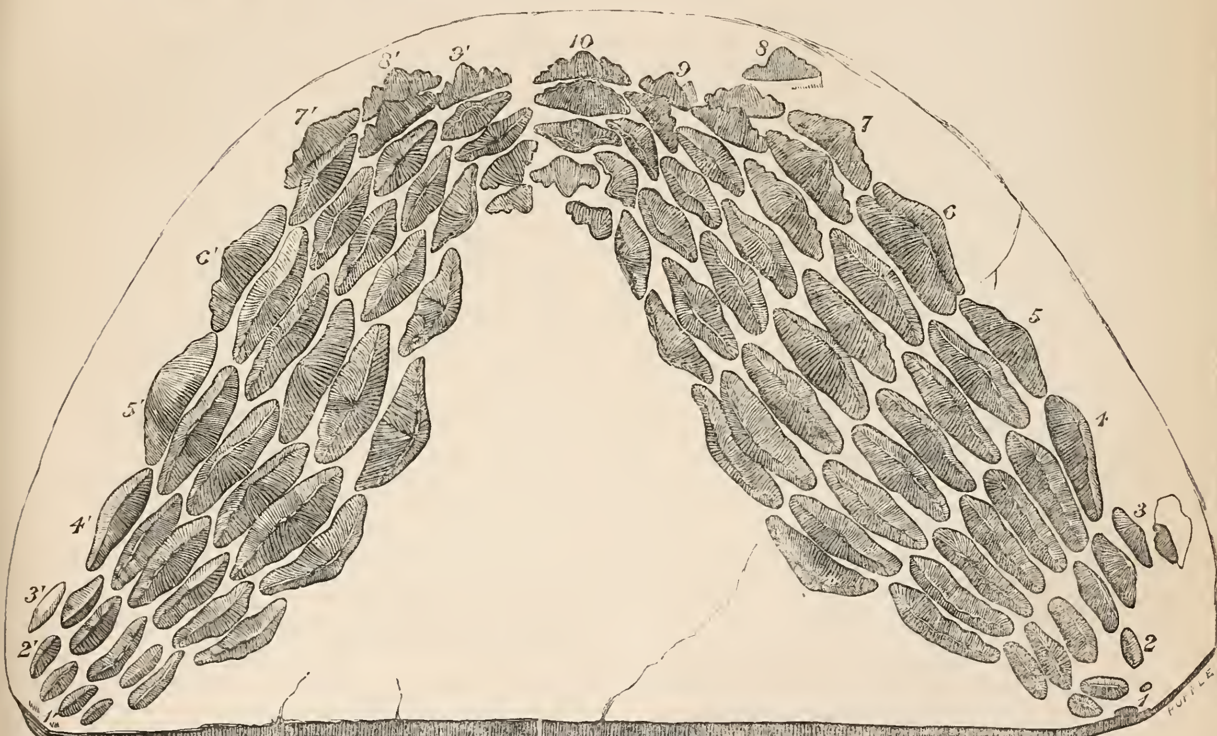


Fig. 84.—Jaw of *Acrodus Anningiæ*. (After E. C. H. Day.)

One other extinct genus is usually referred to the Cestraciontidæ,—*Plethodus* from the English Chalk. It is founded upon detached dental plates, which are flat, and of somewhat irregular outline, with a punctated grinding surface.

(*To be continued.*)

"ENGINEERING" mentions weather vanes illuminated by electricity, and a trial suggested with one twenty feet long, with a light at either end.

MY GARDEN PETS.

By E. H. Robertson.

Part II.

SPRING-TIME is particularly disastrous to my pets. Tempted by the bright sunshine they roam to distant pastures, to provide for the wants of a daily increasing family. After a night's rest and refreshment, they issue forth full of energy, and without impedimenta, but return later in the day tired and heavily laden, to be cut down on the very threshold of home, by the cruel, biting wind, thousands of the weary labourers being thus sometimes lost. To a lover of bees it is distressing to see the ground strewn with their chilled carcases, and, as I never pass a chilled bee without making an effort to warm him into life, I gather mine into a bell glass, which, inverted over a stand, I place before a fire. I may have collected but a score, perhaps it contains 500 or 600. Soon the inert mass shows signs of vitality—here and there a tiny leg or antenna quivers, a silvery wing shimmers in the flickering firelight, a few moments later and sundry pollen-laden little fellows may be seen brushing their coats and wings, and loudly buzzing, as they scamper up and down the side of their prison, in search of some means of escape, and soon nearly all are astir. Turning the glass mouth upwards in the open air, the thoroughly resuscitated fly off to their hives, a few not yet fully recovered, after a short flight, descending to the ground, to be returned to the glass, rewarmed, and fed with honey until fully restored. Sometimes every bee may thus be brought back to life, but more frequently a small proportion (say from five to twenty per cent.) are not to be so easily restored; they are almost invariably the old and worn out, quickly recognised by their black, hairless bodies, whose slender thread of life has been severed by the north wind's keen edge. If apparently drowned bees be placed upon a blotting pad, and thus treated, the genial warmth will almost certainly revive them.

To a person not familiar with bees the statement that the sounds emitted by them are as varied, and as expressive of fear, anger, pain, &c., as are those of human and other animals, may seem incredible; it is, nevertheless, strictly and literally true, and the ear of the experienced apiarian, or observant naturalist, soon learns to distinguish them. There is not a greater difference between the soft purr of the contented puss, and her threatening growl when tearing her prey, her pleading "mew," and her diabolic caterwauling, or unearthly sleep-disturbing yell, than there is between the droning hum of the tired homing bee, and the fierce threatening buzz which warns the intruder to decamp.

The crisp whirr with which the active little fellow springs from the threshold of his hive into the regions of light cannot pass unnoticed, and the delightsome hum which expresses his happiness, as he circles and shoots to and fro, when the cloud-dispelling sun cheers him into activity, is pleasant indeed to him who loves such rural sounds. His pathetic cry of distress, too, when unable to extricate himself from the cruel grip of a spider, or has been accidentally squeezed beneath some weight, calls for the ready help of him whose ear is alive to the cry of pain. This diversity of cries alone should teach the novice when to avoid proximity to bees' quarters; but as there is an art in seeing, so is there in hearing, and some there are who never learn, and if they have anything to do with bees they soon pay the penalty of their ignorance.

Dear reader, have you ever witnessed the contortions of a terror-stricken bee observer? If not I can promise you an entertaining sight, and even if you be an unfortunate wight upon whose liver that most baleful of all subtle malignancies—the east wind—has laid its firmest hold, it will most assuredly provoke your mirth. It always reminds me of the mechanical figures which the cockney void of taste erects upon a post or staff in his small garden. The figure gyrates upon a pivot, and every breath of wind sets in rapid motion, windmill fashion, two fin-like appendages, that are supposed, by a wide stretch of the imagination, to resemble arms. See but the terrified one as he wildly smites the air in his futile efforts to beat down his puny foe, and the inanimate figure will present itself to the mind's eye. His ludicrous antics can have but one effect. The bee, perfectly innocent of mischief, naturally enough believes itself to be the object of unprovoked attack, and, resentful, makes short work of his enemy, and if the latter escape scot free his escape is due either to the thickness of his garments, or, more probably, to the hastiness of his retreat. It may be stated that, as a rule, bees never sting when roaming, nor even close to their homes, unless irritated by the recent plunder of their store, or disturbed by the passing and repassing of any person in front of their hives.

Perhaps there is nothing that more readily excites a bee to anger than the latter. The term vicious, so often applied to bees and wasps by the ignorant, is a senseless misnomer, and although there is probably as great a diversity of disposition to be found in any one bee community as amongst the individuals of other races, they are most certainly not aggressive, and the notion that they sting of *malice prepense* is an absurd one. Even a stranger may, with impunity, stand before a hive when bees are returning home heavily laden, and although his garments may be thickly studded with the weary little labourers, not one will molest him, nay, if the tip of the finger be presented, the tired insect will almost invariably accept the proffered aid. Let the stranger, however, beware lest some watchful sentinel dashes at some unprotected part of his person.

When beekeepers are standing near hives, single bees very frequently make close examinaiion of the intruder. I am constantly the object of their close attention. Perhaps the little examiner is but passing away a spare moment by way of recreation, probably, mistrustful, he is warning me to give his home and friends a wider berth. First he buzzes within an inch of one eye, then visits its fellow, then makes a tour of inspection, sounding his trumpet first in one ear, then in the other, his observations being almost entirely confined to the head. When I hear his threatening buzz, knowing that he is not to be trifled with, and wishing to spare his life, I close my eyes and remain quite stationary, and, after awhile, my little friend, seeing that he has nothing to fear, settles usually upon my face, sometimes the lobe of an ear, more frequently the tip of my nose, and after a few preliminary brushings up pursues his peaceful way, and I mine. We have become better acquainted, and he is far less likely to trouble me on any future occasion, whereas a timid person would, by his frantic fears, provoke a catastrophe. His terror may perhaps be excused, when it is remembered that the dislike is probably mutual; bees' antipathy to particular individuals being as remarkable as their liking for others, and, whilst some persons may handle them with impunity, there are others who dare not venture within yards of their hives without being attacked. That the odour of some persons, not perhaps in itself unpleasant, may yet be disliked by the bees, is the most reasonable explanation of the strange facts that can be offered.

Swalcliffe, Banbury, Oxon.

ARTISTIC GEOLOGY.

Ffestiniog and its Neighbourhood.

By T. Mellard Reade, F.G.S., &c.

In addition to its reputation for picturesque scenery, and the soft beauties of its vale, Ffestiniog is a very good centre for the geological student. Situated on a sort of promontory between two valleys, the Cynfael and the Dwyryd, at a sufficient elevation to maintain a bracing atmosphere, the mind and body retain that elasticity which makes mountain scenery so enjoyable. At the same time, those whose delight is the investigation of nature can fully gratify their cravings. I will proceed to describe some of the geological problems which force themselves upon the notice of the thoughtful mind.

SURFACE FEATURES.

The grand flank of Moelwyn, perhaps the finest mountain of its height I have ever seen, is to my mind of more interest than the much, if not over, praised vale. It can be seen at one view from base to summit. The river Dwyryd runs deep below you at the bottom of the vale, while Moelwyn rises from a tree-covered breastwork of hills in a great and serried scarp from Tan-y-Bwlch to Blaenau Ffestiniog slate quarries. Its beauty, to my mind, is its variety, the contrast between the ornamental nature of its foreground of hills, and the steep treeless scarp of its main mass. Facing the south-east, it changes much under the varying light of the sun, now lighted up in every detail of its structure, and anon a vast mystery of gloom. A descent from the village of Ffestiniog to the Dwyryd down a steep footwalk gives us some very picturesque views. The vale is well wooded. We cross the river by a foot-bridge, noticing, by the way, some well-rounded boulders in the river bed. Ascending the other bank we strike the main road which skirts a deep and picturesque ravine thickly timbered. Arriving at the turnpike, we turn towards Tan-y-Grisiau, noticing a large bank of drift which lies near the fork of two streams, one of which rises in Cwm Orthin, the other nearer the slate quarries of Blaenau. The road to Tan-y-Grisiau skirts the former stream, in which are two very picturesque falls. The lower fall is crossed by a bridge just above it. Passing over this, with some climbing through ferns and heath, and over walls ascending the right bank of the stream, we get a very beautiful view of this upper fall. The rock here is part of a large mass of intrusive Syenite forming Moel Tan-y-Grisiau, and the stream has cut back a deep gorge into it. Further along, the stream can be again crossed by another bridge near to Tan-y-Grisiau. At the Tan-y-Grisiau station of the narrow gauge or "Toy" railway we begin the ascent of Moelwyn. Skirting the railway and ascending a footpath, not very difficult climbing, we reach Llyn Trwstyllon, a cwm lying under the great scarped face of Moelwyn. The rocks at the open part of the cwm slope towards the lake. The dip is 18° north-west. It appears to be striated south-east, but very faintly. The surface of the rock is much broken up in places since the glaciation. The cwm is a very perfect cup, broken through on the south-east side. The scenery is very fine. A steep ascent of green turf-covered slope brings us on to the back of Moelwyn. The remainder of the ascent is up what appears from below a small hillock, but develops into a mountain when you get on to it. It is very steep and grass-covered, sheep grazing up to the very top. A magnificent view rewarded our exertions, the weather being delightfully bright and clear, and the light breeze exhilarating. I have been up many mountains, but never saw a finer view than that to the north-west over Snowdon. I preserved my impressions in a sketch taken at the time, in which the mountain forms are reproduced in outline. It represents a grand series of mountains rising in a low but sublime pyramidal mass culminating in the peak of Snowdon. The hollow of Llyn Llydaw, the entrance to the pass of Llanberis, and the Glyders, and other

well-known features are distinctly visible. To the left is a glimpse of the sea high up in the horizon. Moel Hebog, the Glaslyn and pont Aberglaslyn are also distinguishable. The Glaslyn runs like a silver streak through a mass of green fields to the Traeth Mawr. Beyond is the embankment across the marsh for the road and railway terminating in Port Madoc, the houses showing distinct and clear with Moel-y-geist in the back-ground, and in the far distance stretches the long promontory of Caernarvonshire till almost lost in the blue haze of the distant sea. The Rivals showed like little cobs on the relief map of Caernarvonshire. Further to the west shone the brilliant orange sands of the estuary of the Dwyryd below Tan-y-Bwlch, and beyond this was the sea with its shore sweeping round to Harlech Castle, which, with its towers, appeared as a little group of dots. To the south could be seen the Rhinogs, and the long scarped face of Cader Idris beyond, and, to the east, appeared a sea of mountains out of which arose the Arenigs and the Arrans. To the north the land rose and fell in billowy swells till lost in the grey haze.

The immediate foreground of the view over Snowdonia is occupied with the remarkable mountain called Cynicht. From the road between Tan-y-Bwlch and Bethgelert this mountain looks like a pyramid; but it is there seen in profile. From the summit of Moelwyn we see it as a long ridge with its flanks scored with gullies and talus, which traverse its steep sides like streams till they become confluent in the talus cones at the foot. Immediately below, to the left, were the rocky north-west precipices of Moelwyn. The day was a perfect day, the clouds floating high, the air clear and exhilarating, yet warm.

I have dwelt upon this view perhaps more than a geological article warrants; but let us pause and consider if it will yield us any scientific information.

The traveller about Ffestiniog will soon find out, if he carries a compass with him, that the general strike of the rocks is from south-west to north-east. At right angles to this the strata have been thrown into a series of anticlinal and synclinal folds, broken up, and, to some extent, obscured, by faults, it is true. Perhaps this feature in the structure of the country can be best appreciated in the general view of the mountains of Snowdonia obtained on the coast road between Maentwrog and Harlech. It can, however, be observed on Moelwyn itself. A slate quarry on the back of Moelwyn shows the rock to dip rapidly to the north-west. Without going into details, the structure of the mountain is a series of shales and slates, with an interbedded massive series of felstones and felspathic ashes.

It is these hard massive beds which form the grand scarp in which lies Llyn Trwstyllon. The whole of these beds belong to the Lower Silurian series, commencing with the Lingula beds in the Ffestiniog and Tan-y-Bwlch valley, and terminating in the Bala beds at the summit of Cynicht. The slates of commerce are interbedded in the series, and as the beds dip steeply to the north-west the quarrying operations have to be mostly followed by galleries, and not in great cuttings open to broad daylight, as is the case with the quarries at Penrhyn, near Bangor, which lie in the older Cambrian slates. To the north, in the valley of Dolwyddelan, the calcareous ashes there largely developed are the actual representatives of the Bala limestone and the Caradoc sandstone of Shropshire, and the vast masses of ashes that crown the felstones of Snowdon and Moel Hebog are but an enlarged development of the same strata.*

To understand the present surface form of the country, it is requisite to keep in mind the great fact that the whole of the Upper Silurian strata which formerly covered Merioneth and Caernarvonshire has been entirely removed by denudation. It is only when we get as far to the south-east as the river Vyrnwy, where the great reservoir to supply Liverpool is being constructed, that we come upon the remains of the Upper Silurian, here preserved in a synclinal. A general glance at the geological map of North Wales shows the persistent strike of all the rocks from south-west to north-east. It is along these lines that the denudation has principally acted, many of the main valleys possessing the same parallelism of direction. The hard beds of felstone and ash, and the intrusive greenstones and other igneous rocks, have helped to preserve that peaked and ridgy character which here gives the distinguishing beauty to the scenery.

A walk down the north-west slope of Moelwyn brings us to Bwlch Cwm Orthin, a pass between Cwm Orthin and Cwm Croesor, which lies between Cynicht and Moelwyn. Here we may stop to examine some slate works. The slates are generally of small size, but beautifully true and fine. Descending the path to Cwm Orthin, we get a good view of the Llyn below, now being rapidly filled up with the debris from the Cwm Orthin slate quarries.

At the entrance to the cwm may be seen those well-rounded rocks specially noted by Ramsay as good instances of *roche moutonnée* glaciation. Beyond these we may again examine slate works. Here some of the slate is of that peculiarly fine and soft nature which fits it for manufacture into school slates, the process of which may be watched. I impressed on my mind the view of Cwm Orthin looking towards the glaciated rocks, in the best possible way, by sketching it. It is a true rock basin, the dip of the strata to the north-west and the hardness of the felspathic rocks at the outlet, no doubt being determining causes, together with ice, in producing this form of denudation. A steep down-hill walk brings us to Tan-y-Grisiau station, but we may pause a moment to look at the waterfall. The stream from

* Ramsay, "Memoir of the Geology of North Wales," 1st ed. p. 95.

the Llyn Cwm Orthin has cut a narrow channel in the rock, some fifteen feet deep, I should judge. It then falls about twenty feet down a nearly vertical joint plane. The peculiarity that attracts attention is the extraordinarily small influence the water has had in eating away the surface down which it falls, and the great effect it has had upon its more horizontal bed. This is a characteristic that may be observed elsewhere, at the Rhiadr Ddu, or Maentwrog falls, for instance. It seems to point to the grinding action of stones, sand, and gravel, as the effective cause in the sawing down of a stream-bed, in hard rock, in a mountain district. These materials propelled along the bed of the stream would be always in contact with the rock, whereas at the fall they would be shot over, often without touching the vertical face. This subject of waterfall denudation, is one that requires exploration. I am not aware of any geologist having specially investigated the subject.

We have now returned to the point we commenced to ascend, having made a circular tour on Moelwyn. We may return to Ffestiniog by another route, by following the road towards Blaenau. I would recommend two excursions to be made of this, which I have described as one. A drive to Tan-y-Grisiau to commence with, will leave quite enough work to be done on Moelwyn. The geologist will then commence his work fresh, and will experience no difficulty on the return journey in walking back to Ffestiniog.

(*To be continued.*)

SCIENCE-GOSSIP.

The first balloon ascent ever made in our army in presence of the enemy, took place near Suakin on the 25th of March. The balloon used was made of gold-beaters' skin, contained 7000 cubic feet of gas, measured 23 feet in diameter, and weighed 90 lbs. It was inflated from compressed reservoirs with gas made at Chatham, and was guided by means of a rope attached to a wagon below. Communication was kept up by means of pieces of paper attached by a loop to a rope. The balloon remained up nine hours, and the results were apparently considered successful.

We have received a pamphlet by Mr. G. A. Rowell, entitled, "Electric Meteorology. What is Gas? How the Theory was worked up. An Appendix, 1884."

In "Science" for February, is an account by Lieut. Greeley of the geographical work of the late Arctic expedition, illustrated by a large map. The discoveries made to the westward of his winter quarters into Grinnell Land and Arthur Land led Lieut. Greeley to the opinion that the western shores of these regions will be found at no great distance.

The "Annales Industrielles" give an account, says "Science," of the making of cork bricks, now being employed for coating steam-boilers, ice-cellars, &c. The cork is winnowed from impurities, ground in a mill, kneaded up with a suitable cement, and pressed into bricks; then dried, first in the air, and afterwards by artificial heat. They are not hard, and not liable to decomposition; they keep out moisture, heat, cold, and sound.

In its bearing on the question of hereditary transmission of peculiarities, the following case, recently reported to the "Lancet" from Bridgewater, is interesting. The abnormal number of six digits occurred in the case of a man, his son, his grandchild, and two grandchildren (not all in linear descent), and in all cases it was the left foot which possessed the extra feature.

In a paper lately read at a meeting of the Chemical Society, Mr. H. Brereton Baker, F.C.S., described some experiments he had made with reference to the effect of moisture upon combustion. He heated both amorphous phosphorus and carbon in dried oxygen and in oxygen saturated with moisture. In both tubes containing moist gas, combustion took place, but in the dry gas, the phosphorus slowly distilled, forming a red and yellow deposit on the cooler part of the tube, while in the case of the carbon in dry gas, no apparent combustion took place. Dr. Armstrong said he had some time ago come to the conclusion that probably chemical action did not take place between two substances, and that he had even ventured to affirm that some day it would be found that a mixture of pure oxygen with pure hydrogen was not explosive.

In the Annals and Mag. Nat. Hist. for last month is a description by Mr. C. V. Riley, of a new insect injurious to wheat, to which the name of *Isosoma grandis* has been given.

The strict political economists will have in future to make allowance for new motives and new courses of action. It deserves to be placed on record that the workmen in the employ of Messrs. William Cooke & Co., of the Tinsley Iron, Steel and Wire Works recently offered a week's work without wages, which was accepted by their employers. The men, being desirous of assisting their employers in some way during the present depression in trade, and being unable to accept reduced wages, in consequence of their being controlled by a board in this matter, decided to make this generous offer, one probably without precedent in English trade, and which has naturally attracted considerable notice.

Sir William Dawson, principal of M'Gill College, Montreal, has been nominated president at the meeting of the British Association at Birmingham next year, 1886.

AFTER a colliery explosion at Unsworth in March last, Mr. C. S. Lindsay showed great endurance and heroism in endeavouring to save the lives of two fellow explorers who were overcome by choke-damp. Mr. Lindsay is said to have carried iron nails in his mouth, which he sucked, and was thus enabled to resist the effects of the choke-damp longer than his companions. The explanation given was that the carbonic acid gas coming into contact with oxide of iron formed insoluble carbonate of iron and so was rendered innocuous. F. R. S., writing to the "Times," with reference to this explosion, says that the quantity of carbonic acid absorbed by this means is inappreciable, as might indeed be expected, and suggests a respirator filled with cotton-wool and slaked lime or caustic soda, to absorb the carbonic acid gas or choke-damp; "or, better still, a cylinder filled with the same material carried on the back with a flexible breathing tube and mouthpiece will enable an explorer to remain for some time in an atmosphere charged with choke-damp which would be at once fatal if inspired directly."

THOUGH rather late, it may not be amiss to warn those of our readers who are experimental chemists against phosphorus trichloride. Dr. Edward Divers, principal of the Imperial Engineering College, Japan, has had a severe accident through the bursting of a bottle containing the trichloride. It had been used for years as a lecture specimen, but while Dr. Divers was warming the neck in order to extract the stopper the bottle burst, and the injury caused was so serious that it was feared the sight of one eye would be destroyed.

A USEFUL means of cultivating among its readers that desirable faculty, observation, is afforded by the "Natural History Journal and School Reporter," in the form of a list of flowers with dates of opening, the average of three years, appended, so that early appearances may be noted, and a Floral Calendar formed. This Journal which is conducted by the Society of Friends' Schools, and is published by William Sessions, York, is in many respects a good example of a school magazine, and the amount of attention to Natural Science which it reveals is highly commendable.

MR. ADAM SEDGWICK has in preparation a new book, to be entitled "The Elements of Animal Biology," which is intended to serve as an introduction to the study of Animal Morphology and Physiology. Messrs. Swan Sonnenschein & Co. are to be the publishers.

WE have received a report of a lecture by Mr. E. Lovett, delivered before the Croydon Microscopical and Natural History Club. The subject of the paper was the evolution of the fish-hook from prehistoric times.

WE must have systematic names in science, we cannot communicate our knowledge satisfactorily without them, but they are not science. What do our readers think of "*Amblystoma tigrinum mavortium hallowelli suspectum maculatissimum*" for a systematic name? But this is the sort of thing held out in "Nature," as an example of what trinomialism may lead to. It is said that a shortening process has been devised, whereby the above may be written "($C^{a1'}$) *Amblystoma tigrinum.*" This looks as if scientific knowledge, instead of being open to common folk, as it ought to be, were to be the exclusive property of the favoured few, and to be hedged round with mystery as it was in the middle ages.

JAPAN seems at present to be the headquarters of earthquake study, and we have fortunately so few earthquakes in this country that no such systematic attention has been given to them. Meantime the one which occurred in the East of England in April last year has been turned to good account after the event. In the February number of the "Proceedings of the Geologists' Association," is a paper with map by Mr. R. Meldola, F.R.A.S., on some of its Geological aspects. The author, discussing the position of the palæozoic and other rocks below the surface, regards the older rocks as not being necessarily concerned with the origin of the earthquake. The disturbance originating below later formations was first spread by the harder sub-cretaceous rocks, and at the extreme limits the shock was propagated along the palæozoic rocks which acted as mechanical conductors of the wave, and thus, as it were, exaggerated the westward extension of the effects.

MICROSCOPY.

A NEW BACILLUS.—At a recent meeting of the Royal Microscopical Society, an account of a new Bacillus (*B. alvei*) was given by Messrs. Cheshire and Cheyne. This bacillus is the cause of a serious disease which has prevailed among hive bees, exterminating, in some cases, whole stocks; both larvæ and bees, including the queen, being affected by it. The disease readily yields to treatment, which consists in feeding the larvæ with syrup containing 1-600 per cent. of phenol.

MICRO-ORGANISM OF SWINE-PLAGUE.—At a meeting in January of the New York Microscopical Society it was stated that Dr. Salmon had recently demonstrated the presence of micrococcus in *Pneumoenteritis*, or swine-plague, of which bacilli had been said to be characteristic, and that Dr. Sternberg had just obtained a pure culture of the micrococcus of this disease.

Staining Nerve and Muscle.—As to the most perfect mode of demonstrating the distribution of nervous structures microscopists differ. Klein and Cohnheim consider that preparation stained with chloride of gold will show the ultimate ramifications of nerve fibres; whilst Beale ("Microscope in Medicine") says he has never been able to demonstrate the final distribution of nerve fibres by the chloride of gold stain, but did so by specially preparing the specimens and then acting on it with acetic acid. Soak the specimen in glycerine for some days, beginning with a weak watery solution, and gradually increasing the density of the fluid, finishing with Price's glycerine, sp. gr. 1240. Now wash the tissue with glycerine containing 5 drops of acetic acid to the ounce. Put a drop of glycerine, containing 2 drops of acetic acid to the ounce, on a clean slide, place the tissue in it, and apply a thin cover glass. Examine with a high power. The prolonged action of the acid causes the nerve fibres to become slightly granular, and thus to be easily distinguished from the tissues in which they ramify. The muscular structures of the specimen will also be shown by this mode of preparation.—*Dunley Owen, B.Sc.*

Examination of Fibres, &c.—The "American Monthly Microscopical Journal" for March contains a translation, from "Etudes sur les Fibres," by M. Vétillart, in which flax, hemp, nettle, cotton, jute, phormium, and other fibres are classified and their appearance, dimensions, &c., described. The preliminary directions given, however, scarcely seem full enough, but the translation is not stated to be a continuation.

Crystals for the Polariscope.—It is most vexatious that some of these attractive preparations should be so fleeting. From my own experience this applies to some only, for others appear to be just as enduring. I once had a somewhat large collection of objects of this class, but as they deteriorated I took them to pieces until only a few now remain. All crystals containing sulphate of copper lost their sharpness in a few weeks, and were almost useless in a few months. Sulphate of iron also lost its sharpness, but afterwards appeared to get no worse, while crystals of oxalurate of ammonia, hippuric acid, and salicine are in every respect as beautiful and perfect as when prepared some seven or eight years ago. That dampness will destroy these objects I have had abundant proof; for, once wishing to finish off two slides in a hurry, and my brown-cement being dried up, I ran a ring of gum-water round the cover-glasses and afterwards finished them. Shortly, the crystals could be distinctly seen dissolving from the outer edge, their gradual dissolution towards the centre being very interesting under the microscope. A friend who devoted much time to this branch of microscopy once told me that pure balsam would preserve crystals, that would gradually dissolve if the balsam contained turpentine. Perhaps some readers can say whether this is so, or whether gum dammar or copal would be a better preservative, for any method of micro preparation that is not permanent must be very unsatisfactory.—*J. W. Neville, Handsworth.*

I venture to ask you to give me space for an appeal to brother microscopists in various parts of the world. I am desirous of obtaining samples of mud from abroad, especially from tropical and sub-tropical countries in South America and elsewhere, with a view of cultivating them here. I hope, by so doing, to bring to light many new forms, both of infusoria and rotifera, as the power which these creatures have of protecting themselves against changes in external conditions is so great. The mud should be taken from the surface of the bed of a pond or lake, or some similar body of water, preferably from the surface of the part which dried up last, and should be labelled with the name of the locality. A few ounces will be amply sufficient from each spot, and I shall be glad to refund any expense incurred in forwarding, and to communicate results to the senders.—*Edward C. Bousfield, 363, Old Kent Road, London, S.E.*

ZOOLOGY.

Astarte Borealis.—I have received amongst other shore-shells from the beach at Warkworth, Northumberland, a valve of this shell with a very fresh epidermis. Its condition resembles that of specimens taken from a fish's stomach.—R. D. Darbishire, in "The Journal of Conchology."

The Proceedings of the Holmesdale Natural History Club for 1881–2–3, recently published, contains an interesting paper by Mr. H. M. Wallis, of Reading, on "Character, as one of the Causes of the Rarity or Abundance of Different Species of Birds." In it the author points out how the different qualities of brute courage, "coolness," teachableness, and adaptiveness, operate in different cases for or against their possessors in the struggle for existence. Sparrows drive martins from their nests and pigeons from their food, and in the winter during stress of weather such boldness would serve the sparrow in good stead. The amount of disturbance birds will tolerate during nesting varies with different species, and the more timid a bird is the less will be its chance of bringing up its young. The Great Auk has been exterminated through its clinging to its traditional breeding sites while the Greater Shearwater escapes in consequence of its solitary habits, so that nothing is known of its nest or eggs. Other instances of the adaptive faculties of birds are given by Mr. Wallis, whose paper is most readable

and interesting. The Proceedings contain also reports of many other papers or addresses, together with other matter botanical, geological and microscopical, and accounts of numerous excursions. The Holmesdale Club, most of whose members hail from Redhill and Reigate, appears to be in a very flourishing condition.

ARION ATER, VAR. BICOLOR.—This variety which I noted in a late number of SCIENCE-GOSSIP, as being found near Stroud, and referring to which Mr. T. D. A. Cockerell in his note last month mentions that I do not give any description of the slug, is upon the authority of Mr. Roebuck, the recorder for the Conchological Society, to whom I sent some specimens, not having noticed it before or having means to identify it. He wrote me, that though he had it previously sent to him from Ireland, this was the first time he had seen it from an English locality. Not taking any notes at the time, nor able at present to visit the place where I found them, I cannot venture upon any accurate description, but, if Mr. Cockerell will send me his address, I shall be happy to forward him some specimens of this interesting variety when I can procure them. I may mention here, that the chosen locality of this variety seems to be damp marsh spots. Have any readers of SCIENCE-GOSSIP, who take an interest in these matters, met with a variety of *Arion ater*, which has the wrinkles of the skin and the mantle of a unicolorous ash colour, and the interstices of a much lighter colour, almost white, so that when the animal is extended it appears much lighter. This I have found in company with the common black kind, but have not noticed any of an intermediate character.—*E. J. Elliot*, *Stroud*, *Glos.*

NOTES ON MOLLUSCA, MIDDLESEX AND KENT.—*Limax lævis.* On March 29 I found this species in a damp spot near the Thames at Twickenham, associated with *H. pulchella*, *Z. crystallinus*, *C. lubrica*, and *Carychium minimum.* The river here is very prolific in freshwater shells. I have seen the bed at low water covered with countless specimens of *Unio pictorum* and *Anodonta anatina*, dotted here and there with *Lim. peregra*, *L. auricularia*, *Ancylus fluviatilis*, *Paludina vivipara*, and *Neritina fluviatilis;* while the grassy banks abound in *L. palustris*, *L. truncatula*, and *Succinea elegans.* On April 5, I again met with *Limax lævis* living under very similar conditions on the banks of the Cray, at St. Mary Cray in Kent, this time with *Zonites nitidus*, *H. concinna*, *Succinea elegans*, and *S. virescens*, as well as *Z. crystallinus* and *Car. minimum.* The river contains *Sph. corneum*, *B. tentaculata*, *V. piscinalis*, *V. cristata*, *Plan. vortex*, *P. contortus*, *P. complanatus*, *Lim. peregra*, and *L. palustris.* I may here mention that *L. lævis* is the ninth species of slug recorded for Middlesex, the others being *Arion ater*, *A. hortensis*, *Amalia gagates*, *A. marginata*, *Limax flavus*, *L. agrestis*, *L. maximus*, and, last, but not least, *Testacella haliotidea*, v. *scutulum*, which has been found in gardens in various parts of the country, including Bedford Park.—*Sydney C. Cockerell.*

BOTANY.

SWISS PLANTS.—Your notice in SCIENCE-GOSSIP (January) called my attention to your observation about the double dahlia. I have watched the enclosed *Cyclamen Europæum*, apprehending by the slowness in its full flower that it would be overpowered by the first flower. It has succeeded. This plant is cultivated and the second year with me, first with the double flower, originally brought to a nursery here found only at one place; up the mountain two miles off there I have found it. I have now collected over 1000 wild flowers, &c., and having duplicates I offered exchange. After five or six years search in the four cantons by a celebrated botanist here, the result did not exceed 1415; a few new ones I have found, he has added to the work he had published, and is pleased with my searchings.—*I. H. C. Russell.*

HELLEBORUS VIRIDIS.—Dr. FitzGerald observes of this plant: "I was struck with the curious form of the stem immediately beneath the flower. It has a wrinkled appearance for about half-an-inch." Having a number of recently gathered specimens before me, March 30, I would remark that while the stems immediately beneath the flower have uniformly this wrinkled appearance of various length, it is also to be observed on the petioles, in one instance I find it nearly three inches long. The cuticle of this plant seems to be of unusual tenuity, which may account for the circumstance mentioned. I am not acquainted with the growth of this hellebore at a later stage, but hope to note it further on.—*F. H. Arnold.*

WATSON BOTANICAL EXCHANGE CLUB.—We have received a Report of this recently formed club, the object of which is "to promote more intercourse, help, and exchange, between working botanists, and particularly with regard to critical species." The club already numbers over thirty members, and the report contains a long list of desiderata which should give them plenty of work during the coming season. The hon. sec. is Mr. A. R. Waller, Low Ousegate, York.

A BEAUTIFUL specimen of the osprey (*Pandion haliæetus*) visited Copmere in October 1882, and remained a week on its southern migration.—*W. Wells Braden.*

GEOLOGY, &c.

Flint or Stone Implements.—A considerable number of flint and stone implements has from time to time been found on the top of a ridge of fell-land lying between the East and West Allen, about two-and-a-half miles south-west of Allendale town. Although the number now known to be preserved is large, yet the probability is that it does not represent a tithe of those which are lost. Until a few years ago, the country people living in the district were in the habit of picking up these flint implements and taking them home to strike a light for their pipe. The greatest portion of the implements are composed of flint of various colours, white, red, black, &c., and consist principally of arrow heads of various forms, leaf shaped, stemmed, double and single barbed, and a very few triangular. Some of the double barbed are formed with great exactness; sharply pointed with serrated edges and chipped to a fineness almost microscopic. The serration is of great precision, showing a wonderful uniformity in size, and occur in about equal numbers on both edges. Scrapers, hatchets, saws, flukes, cores and chippings—the latter three being numerous—have also been found. A few implements of greenstone have also been found. The ground where all these articles have been found is covered with a thin deposit of peat of about a foot or 18 inches in thickness, and it is below this where they have been picked up. Similar implements have also been found on some of the adjacent Fells; for instance, Kilhope Fell, near Bent-Head, Wellhope Fell, Weardale, Langley Mill Fell, Plenmiller Fell, &c.—*Dipton Burn.*

The Position of Pterichthys.—In the March number of the "American Naturalist," Professor E. D. Cope gives the results of an examination of numerous specimens of *P. Canadensis.* He points out three important peculiarities, the presence of a single opening in the middle line above, which is comparable with the "nasal pouch" of the lampreys; the absence of orbits, which condition is comparable with that of the lancelet; and the absence of a lower jaw, in which it agrees with both these types. Professor Cope finds resemblances between Pterichthys and the tunicate *Chelyosoma*, and thinks that the former genus may have descended from such a type as would be represented by the larva of Chelyosoma, if that be caudate and notochordal as are other Tunicata, and especially if the larvæ possess lateral limb-like processes as in the Appendicularia. The tail has been retained in the European form of Pterichthys, but no trace was found of it in *P. Canadensis.* In view of the single cephalic opening being the mouth, the author considers that this family should be removed from the Craniata to the Urochorda. Among these, it differs from the Tunicata in having the anus in the normal position, and he proposes to form a second order of the class to receive it, calling the order Antiarcha. Suspecting that *P. Canadensis* should belong to a genus distinct from *P. Milleri*, he would give it, for the present, Eichwald's name Bothriolepis.

The Granite and Schistose Rocks of Northern Donegal.—Dr. Callaway, F.G.S., in a paper read before the Geological Society of London, considers the Donegal granitic rocks to be a true igneous granite, posterior in age to the associated schists. No gradation into other rocks was found; where the granite was in contact with limestone the latter contained garnets. The granite was distinctly foliated, the direction of pressure being perpendicular to the planes of foliation. The author then described the schistose rocks of the region, those of the Lough Foyle series, of most of which the semi-crystalline condition was characteristic, being well seen at Londonderry and on Lough Foyle. This series he referred to the Pebidian system. The schistose rocks of the Kilmacrenan series, with intrusive granite, were described as crystalline and older than the Lough Foyle group. During the discussion which ensued, Mr. Teall and others expressed doubts as to the sufficiency of lithological composition alone for the correlation of rocks.

The Relation of Ulodendron to Lepidodendron, Sigillaria, &c.—At a recent meeting of the Geological Society of London, a paper by Mr. R. Kidston, F.G.S., was read, in which the author expressed the opinion, that the genus Ulodendron of Lindley and Hutton included several species and even different genera; the three species which have furnished the specimens, usually described as Ulodendron, being *Lepidodendron Veltheimianum*, Sternb., *Sigillaria discophora*, König, sp., and *S. Taylori*, Carruthers, sp. He was of opinion that the ulodendroid scars marked the point of attachment of caducous sessile cones. Mr. Carruthers, in the discussion which followed, considered the organs borne by these scars to be aerial roots, while Professor Boyd Dawkins and Professor Seeley agreed with the author that they probably bore seed or fruit organs.

A Recent Tertiary Survival?—At the same meeting, a paper by Dr. H. Woodward was read, on "Steller's Sea-cow" (*Rhytina gigas = R. Stelleri*) a toothless Herbivore which lived along the shore in shallow water. In 1741 it was confined to Behring's Island and Copper Island, but it was believed to have been wholly extirpated by 1780. Dr. Woodward regarded Rhytina as a last surviving species of the old Tertiary group of Sirenians, and its position as marking an "outlier" of the group now swept away.

NOTES AND QUERIES.

LARGE UNIOS AND ANODONS.—In Ossington Lake both unios and anodons were extremely abundant as well as of large size, good food supply, being, I suppose, one reason of this profusion. The water is very rich in lime, containing 16·2 grains of CaO per gallon. This is equal to nearly 29 grains of carbonate of lime. Probably a considerable portion is in the form of sulphate, as veins of gypsum are plentiful in the district; but I had not a sufficient quantity of water to determine this point. I made a note of the distribution of the shells, which the draining of the entire lake rendered easy of observation. In the upper part I found no shells; from the middle they were abundant. A few were close to the edge, about four feet ont, a band of from six to ten feet wide was closely packed with unios and anodons of all sizes. For another couple of yards a few might be found. The whole of the middle of the lake was bare of shells, except a few empty ones, which had probably been carried out by the receding water. The only other species observed in this part were one *S. lacustre*, and a few *L. peregra*.—*W. Gain, Tuxford, Newark.*

HOLLY-LEAVES.—Professor Henslow, writing to "Nature," says that it is not at all usual for hollies to lose the spines of their leaves when the latter are above the reach of cattle. He had several, from six to nearly twenty feet high, and not one had borne an unarmed leaf. Sir John Lubbock, in reply, points out that Hooker, in the "Student's Flora," says of the leaves of holly, "those on the upper branches often entire."

HOLLY LEAVES.—Southey in his beautiful lines on the holly tree, published more than half-a-century ago, makes the fact the central idea of the poem. The second stanza runs thus,

> Below, a circling fence its leaves are seen,
> Wrinkled and keen;
> No grazing cattle through their prickly round
> Can reach to wound;
> But, as they grow where nothing is to fear,
> Smooth and unarmed the pointless leaves appear.
> —*D. S., Exmouth.*

HOLLY LEAVES.—I have frequently noticed that old holly-trees tend to lose the spines on their leaves when above the reach of browsing cattle, as Sir John Lubbock points out. I have noticed it also in old ivy bushes, and enclose you three leaves taken from one such bush; the leaves were picked within six inches of one another.—*M. B. Windus.*

[Other correspondents have written to similar effect as regards holly leaves.]

UNRECOGNISED BIRDS.—I am obliged by the notice taken of my question by Mr. Kelsall, but I am still in the dark, as to my two birds (p. 69). Of the waxwing I have a stuffed specimen, and the stonechat or wheatear I know very well. Perhaps after all my original supposition was correct, viz. that they were two foreign birds escaped from confinement. The colours were bright and vivid as those of the king-fisher. The most noticeable item of colour was a distinct and sharply defined purple band from the base of the beak over the head as far as the shoulders. I shall be glad if some one can help me in fixing my birds.—*H. M., Birkdale.*

PARADISE TREE.—I have seen the account of this wonderful vegetable curiosity, and though I do not know exactly where or when it was published, I think I can add a few more "facts" about it from memory: There is only one group of paradise-trees in existence, and they form a large perfect circle The flowers are exactly like a dove, "every feather perfectly represented." For some reason which I forget, the flower is never fertilised, and in no other manner can any new specimens of the tree be produced, so that the circular groove always has consisted of the same individuals, and will do till the end! I think the foregoing will show that the ardent botanist who wishes to fully and scientifically describe the paradise-tree cannot get far wrong so long as he makes every item sufficiently miraculous.—*H. Snowden Ward.*

PARADISE TREE.—The dove plant (*Peristeria elata*) mentioned by "M. L. S," is not a deciduous orchid, therefore I fail to see how it can be identified with the tree described by "F. S." who writes of the tree "fading away to ashes." This I take to mean simply the leaves dropping off. Even if this were so, there would still remain the large pseudo-bulbs, which would not correspond with the idea of a plant's disappearance. Can your correspondent 'M. L. S.' tell us whether the dove plant is epiphytal or terrestrial? I am at present growing it as an epiphytal orchid, and have succeeded in flowering it under these conditions, but I am unable to say myself whether it is a true epiphyte or not. Its very large pseudo-bulbs would lead one to consider it an epiphytal plant. If this be so, there seems to be more reason to identify it with the reputed paradise tree.—*J. W. Odell.*

VEGETABLE IVORY.—M. S. W., Hereford, would be glad of information about the perforation by insects of vegetable ivory, the nuts of *Phytelephas macrocarpa*, and whether there are any known means of guarding against these ravages. A specimen of the nut, and some of the insects, were sent us, the nut being bored in all directions, and rendered useless for manufacturing purposes.

FOOD FOR TORTOISE.—In answer to a query in SCIENCE-GOSSIP as to proper food for land tortoise. The reason the tortoise mentioned by K. H. I. would not eat lettuce was probably because it had left off eating for the winter. This they generally do as soon as the cold weather sets in, when they make preparations for hybernation. I had one two or three years, and, although he never hybernated, he would not touch a morsel of food throughout the winter, from about the middle of September until the latter end of April, when his appetite returned, and in proportion as the weather got warmer, the more ravenously he ate. Roaming at will in the garden he would eat of just the choicest plants—tiger lilies, pinks, pansies, &c. The proper food to give them is any succulent or milky vegetable or plant, as lettuce, cabbage, dandelion, milk thistle, &c.—*W. Finch, jun., Nottingham.*

FOOD OF TORTOISES.—Had W. Mattieu Williams been as slovenly a gardener as myself, he would doubtless have learned a fact or two in natural history of which his prim and well-kept lawn has evidently held him in ignorance. It appears from his account of the tortoise which fed upon his fine grasses and clover, that these alone fail to impart the robustness requisite for withstanding the severity of our winter. Perhaps, also, he has not in the middle of his lawn, as I have, a number of the old-fashioned fuchsia bushes, surrounding a rockery, and offering a tempting retreat where a tortoise can burrow, and find a comfortable winter's bed. It is seven years next summer, since,

in passing "up" the "High Street" of Deal, a street several feet lower than any of the rest, and perfectly level, I observed an Italian with a truck-load of crawling tortoises, which he was offering for sale. It was a sight calculated, and perhaps intended, to excite compassion. At all events, it did mine, with the result that I sported a shilling, in order that one, at all events, should taste the sweets of liberty. Being placed upon my lawn, it soon found itself "in clover," such a rare variety of food as, I presume, seldom falls to the lot of an alien tortoise. There were docks and plantains, milfoil and mallows, daisies, chickweed, and dove's-foot, trefoil, groundsel, and dandelion. Many of these, with an occasional snap at the young grasses and clover, were quickly utilised; but the prime favourite, and the only food I can ever persuade it to take from my hand is the dandelion, especially the flower. In fact, it is to the dandelion I attribute the creature's preservation. It is now buried beneath one of the fuchsias, from which I hope to see it emerge.—*J. Wallis, Deal.*

A MUSICAL MOUSE.—E. P. Turner writes referring to a recent occasion on which a singing sound, heard in the house of a friend, was said to proceed from a mouse in the wall. Some little time after, a guinea pig which had been injured by a cat was obliged to be drowned. It had kept up almost unceasingly, except when moved, a singing sound. "This sound struck me as being very similar to the singing of the mouse. I held a post-mortem examination on the body and detected two small holes in the skin on the left side, where the cat's teeth had entered and penetrated as far as the lung, round which there was a quantity of gore indicating the rupture of one or two blood vessels. Its left fore-leg was also broken in two places. From the lung being damaged I drew the conclusion that this was the cause of the singing sound."

BIRD'S NESTING-HABITS.—I believe it is generally taken for granted that our song-birds and migrants are in the habit of seeking mates every season, and not keeping to the same mate year after year. I do not know that any author, standard or otherwise, actually states this, but the fact of the raven remaining paired for life is mentioned, as if it were an extraordinary and exceptional fact. Now, in the face of this general understanding, and the very noticeable frequency with which exactly the same nest-sites are used year after year by the same species of bird, it would seem as if a wide field is opened for practical observation during the present spring. I think the conclusion arrived at will be that, almost, if not quite all birds are fairly constant in their attachment. If this is not so, we must conclude that the regularly recurring use of a nesting-site is due either to its very apparent suitability for the purpose, or to the return of one bird of the last year's pair. In the latter case it would be interesting to know whether the old site is in bird-law considered the property of the cock or the hen. Possibly it is inherited by one of the youngsters.—*H. Snowden Ward.*

THE STAR OF BETHLEHEM.—Mr. Swinton appeared to have a difficulty in accepting the explanation of the "Star of the Magi" which I had adopted from St. Chrysostom, viz. that it was a miraculous appearance in the form of a star, because the sacred narrative does not expressly state this. But surely it is the manner of the Scriptures to speak of celestial phenomena according to their appearances. No one supposes that during the battle of Beth-horon the sun actually stood upon Gibeon, or the moon in the valley of Ajalon; but they appeared to remain in the parts of the heavens over those places longer than usual, and the immediate cause which produced this appearance is not recorded. But let me refer Mr. Swinton to a place in the New Testament where the very word star is certainly used for something made to represent the appearance of one. In Acts vii. 43, St. Stephen (quoting from the prophet Amos) says that the Israelites, when wandering in the wilderness carried with them, amongst other idolatrous images, the star of the god Remphan (in the revised version Rephan), which is thought to be a name of the planet Saturn. Most certainly they did not carry the star, but something intended to be an image, representation, or likeness of it.—*W. T. Lynn, Blackheath.*

A CHOKED PERCH. — Curiously enough, last summer, 1884, a large perch (*Perca fluviatilis*, Yarrell), ten inches long, was found in a pond, choked by a small perch. A suitable punishment for cannibalism, and which happens, no doubt, more frequently than is usually thought to be the case.—*E. A., Hertfordshire.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

C. C. D.—See Dr. M. C. Cooke's "Ponds and Ditches," published at 2*s*. 6*d*. by the Society for Promoting Christian Knowledge. There is no cheap book on Algæ. A most elaborate work by Dr. Cooke is now appearing in 2*s*. 6*d*. parts, coloured plates. An older book is Dr. Hassall's, of which a secondhand copy is sometimes obtainable. Works on Diatoms are rare and costly, Smith's "Diatomaceæ" fetching several times its original value. *Leucojum Carpathicum* is not a British plant; *L. æstivum* is the English form.

A. A. and W. C. C.—The exchange columns are intended for exchanges, not sales.

E. H. R.—(1) See our last number. (2) Write to the secretary of the Botanical Record Club, Mr. C. Bailey, F.L.S., Ashfield, College Road, Whalley Range, Manchester. (3) Probably Mr. Bailey will be able to help you in this. (4) Apply to Dr. Carrington, Eccles, near Manchester, who is the authority on the Hepaticæ.

H. LAMB.—Dried specimens look like (1) *Carex glauca*; (2) *Luzula pilosa*; (3) *Luzula Forsteri* (?); (4) a Lepidium (?).

W. (Dorsetshire).—(1) The scientific name of cup moss is *Cenomyce (Scyphophorus) pyxidata*. (2) For Dr. Braithwaite's "Moss Flora," apply direct to the author, 303 Clapham Road, London. The price varies.

R. A. H.—Perhaps "The Fresh and Salt Water Aquarium," by J. G. Wood (Routledge), will answer your purpose. For the other, get "Ponds and Ditches," by Dr. M. C. Cooke (Soc. Prom. Christian Knowledge).

In SCIENCE-GOSSIP for 1879-81, the names and addresses are given of assisting naturalists who are willing to help others in their respective subjects. Will correspondents take note of these? Also see the notice in this number of the Botanical Exchange Club. The subscription is 2*s*. 6*d*. per annum.

WILL Mr. J. E. Ady be so good as to furnish his correct address for publication in this column?

J. G.—We are not aware that Mr. Stevenson's work on British fungi is actually published yet. Perhaps Mr. Stevenson himself will supply us with the publisher's name.

D. B.—Doubtful. Your specimens were too far gone to be satisfactory.

W. S.—Thanks for yours.

BLOSSOMING OF THE ARTICHOKE.—On this and on the origin of the name Jerusalem as applied to it, see vol. i. of SCIENCE-GOSSIP.

INITIALS LOST.—It appears that neither Le Maout and Decaisne nor Sachs mention the nectaries of ferns.

FOR *Zwite*, p. 54, read *Twite*.

EXCHANGES.

Good botanical, histological, crystals, polariscopic, diatoms, fish scales and miscellaneous, microscopic slides for others as good of bacilli, entozoa, algæ, desmids, zoophytes, rocks, fossil woods.—B. Wells, Dalmain Road, Forest Hill.

Science-Gossip for 1883 unbound. What offers? Also Cassell's "Technical Educator," 24 parts, unbound. What offers?—W. C. C., 342 Green Lanes, Finsbury Park, London, N.

Science-Gossip, bound volumes, one each of 1873 to 1879, two of 1880. Exchange for other books, &c.—68 Middle Street, Yeovil.

Wanted, Rye's "British Beetles," and works on entomology. Exchange other works on kindred subjects.—Frederick Bishop, 50 Bartholomew Street, Leicester.

Wanted, specimens of carboniferous limestone from Froghall and Gloucester, good value given in either other rocks, ready for mounting, or well-mounted objects, anatomical or otherwise, also pieces of horn of rhinoceros, bison, &c., for cutting sections from.—R. M., 59 Hind Street, Poplar, London, E.

A herbarium of British plants numbering over 1000 specimens, and including most of the rarest species, all uniformly mounted and labelled; in return, British or other Lepidoptera, or books on natural history.—J. E. Robson, Hartlepool.

Large telescope, with tripod stand and brass elevating rod, in exchange for furniture or pier glass, framed or not.—E. E., 4 Padua Road, Penge, London, S.E.

British land and freshwater shells in exchange for others, duplicates and desiderata numerous; also British land and freshwater for British marine or foreign marine, land, or freshwater species.—W. Gain, Tuxford, Newark.

Wanted, eggs of insects of all kinds, also parasites of birds, fishes, &c., or any other good micro material; will give well-mounted slides in exchange. — C. Collins, Bristol House, Harlesden, N.W.

Wanted, to purchase the following dried specimens of British ferns, viz.: *Polypodium alpestre, Gymnogramma leptophylla, Aspidium thelypteris, Asplenium fontanum, Asplenium Germanicum, Cystopteris montana*.—C. F. Oakley, Lee Street, Uppermill, near Oldham.

Fossils from the Mt. limestone, London clay, Wenlock beds, Great Oolites, chalk infr., Oolites, coal measures, Woolwich beds, in exchange for fossils from Tertiary (animal remains), Bracklesham, flint implements, or fossil fish from chalk.—Geo. E. East, jun., 10 Basinghall Street, London, E.C.

Wanted, old volumes of Science-Gossip, and the following odd numbers: 1881, Jan. to May, inclusive, and July, August, and Sept.; 1882, Sept., Nov., Dec.; 1883, April and May; 1884, Feb., July, Aug. and Sept. Micro objectives, appliances, and material also wanted; will give in return micro slides or British and foreign birds' skins.—Fred Lee-Carter, 25 Landsdowne Terrace, Gosforth, Newcastle-on-Tyne.

Foraminifera.—*Haliphysema tumanowiczii* and *Haplophragmium agglutinans* offered in exchange for other rare species.—F. W. Mellett, Marazion, Cornwall.

Aquarium, 34 × 15 × 15, stand slates and rockwork; will exchange for cabinet suitable for minerals.—H. W., 39 Gower Street, Bedford Square, W.C.

Coins or medals wanted. What offers for twenty-four microscope slides? Six or more exchanged for others. Send list.—Henry E. Ebbage, Framlingham, Suffolk.

Nos. 1 to 54, of "Knowledge" (No. 22 missing); will exchange for minerals, fossils, or micro slides to value.—R. H., 8 Draycott Street, Chelsea, S.W.

Cassell's "Dante," Dore's engravings, perfect condition, unbound. Wanted, first-class microscopical objects, scientific books, or apparatus.—G. E. Cox, Capworth Street, Leyton.

A quantity of micro slides, well-mounted and of various subjects, to exchange for books, micro accessories, shells, or curios.—Alfred Drapper, 275 Abbey Dale Road, Sheffield.

Several well-mounted slides (chiefly botanical and micro fungi) to exchange for others; or will exchange for books on chess, or for scientific works and appliances.—J. W. Horton, Brayford Wharf, Lincoln.

Wanted, good secondhand entomological cabinet; exchange miscellaneous natural history objects, &c. List sent. Silence negative.—F. R. Rowley, 60 Lower Hastings Street, Southfields, Leicester.

Lepidostrobus variabilis fruit of Lepidodendron; fair examples of this I am willing to give for Trilobita or other good characteristic Silurian fossils.—A. Eneas Robertson, 3 Hillhead Gardens, Glasgow.

Wanted, back volumes of Science-Gossip or "Nature" in exchange for forty-nine parts (clean and unbound) of "Conchologia Iconica," published by Mr. Lovell Reeve, containing upwards of 3000 life-size figures beautifully hand coloured. Or what offers? Write first to—S. J. W., 22 Richmond Terrace, Clapham Road, London.

Wanted, examples of the British Limnææ from as many different localities as possible; other British shells in exchange.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick.

Desiderata: northern British (esp.) and foreign shells. Duplicates: *H. revelata, H. aspersa*, var. *tenuis, H. pisana, H. lapicida, Haliotis tuberculata, Pl. nautileus, contortus, corneus, Calyptræa chinensis, B. Leachii, H. ventrosa, H. ulvæ*, &c.—B. Tomlin, Pembroke College, Cambridge.

Several fair duplicates of that rare and lovely butterfly, *Morpho aurora* from Bolivia; also some other South American species lately considered unprocurable; also wings of brilliant species for microscopic work. *Morpho Cypris* exhausted for the present; unanswered applicants kindly accept this notice.—Hudson, Railway Terrace, Cross Lane, Manchester.

"Knowledge," from Oct. 27th, 1882, to Dec. 26th, 1884, 118 numbers in all; also Wood's (Rev. J. G.) "Insects Abroad," 600 illustrations, cloth; wanted, a good microscope, or what offers?—John Inglis, 12 Glen Street, Edinburgh.

Wanted, Science-Gossip for 1883, also Jan. and Feb. 1884, in exchange for vols. xxxviii. (less Nos. 1 to 7), xxxix., and xl. of "English Mechanic," all in clean condition.—F. Stainton, New Street, Chatteris, Cambs.

Wanted, small batches of *Helix nemoralis* and *H. hortensis* from different soils: shells or plants given in exchange.—H. P. Fitzgerald, M.C.S., North Hall, Basingstoke.

Wanted, to exchange British plants; lists exchanged. Likewise British land and freshwater shells.—H. P. Fitzgerald, M.C.S., North Hall, Basingstoke.

Well-mounted teeth of the *Leuciscus rutilus* (showing anchylosis) in exchange for other well-mounted slides.—Charles Arnold, L.D.S., 8 St. John's Villas, New Southgate, N.

Wanted, Science-Gossip from beginning of 1865 to end of 1884, either bound or in loose numbers; and also any other microscopical books or journals. State what is wanted in exchange for them.—Charles Von Eiff, jun., 347 Greenwich Street, New York City.

A strong tricycle, in excellent order, cost 21 guineas; will take a good microscope or botanical works in part or whole payment. Front steering wheel, central gearing, saddle and treadles, ball-bearings.—J. Hamson, 19 Victoria Road, Bedford.

Well-mounted micro slides for exchange; diatoms, entomology, micro-fungi, &c. Lists exchanged. Shall be pleased to hear from former correspondents.—Dr. Moorhead, Errigle, Cootehill, Ireland.

Fine healthy cock canary, sweet singer, in exchange for a good book on British mosses, also a splendid large hen canary for a book on lichens or liverworts.—E. A. M. W., 31 Aynhoe Road, West Kensington Park, W.

Wanted, Science-Gossip, any of the following numbers:—1–34, 51, 52, 55–59, 67, 68, 72, 76, 83, 84. Also any odd numbers of "Zoologist," "Entomologist," "Entomologist's Monthly Magazine," or Loudon's "Magazine of Natural History." Good exchange given in micro slides, birds' eggs (one hole), books, magazines, periodicals, &c.—W. T. Taylor, Seymour House, Keswick.

Eggs of osprey, grosbeak, grebe, petrel, cuckoo, woodpecker, and tern offered for others not in collection.—J. T. T. Reed, Ryhope, Durham Co.

For specimens of *Dreissena polymorpha*, Pall., send box and stamped addressed envelope to—J. M. Campbell, Kelvingrove Park, Glasgow.

Eggs of *Sterna hirundinacea*, Less., from Patagonia, in exchange for other natural history objects. Accepted offers replied to per return.—J. M. Campbell, Kelvingrove Park, Glasgow.

Wanted a fine healthy cock and hen bullfinch or extra fine cock only, will exchange any of the following: "English Mechanic," Nos. 758–796, nos. 788, 776, 770, 790 missing. Gray's "Natural Arrangement of British Plants," in 2 vols. with 21 plates. "Boy's Own Paper," either vol. 3, 4, 5, or 6, in monthly parts with plates and index. Vols. i. and ii. of Imison's "Elements of Science and Art," bound in tree-calf.—W. S. Castle-Turner, 6 Dagnall Park Terrace, Selhurst, S.E.

BOOKS, ETC., RECEIVED.

"The Metaphysical Aspect of Natural History," by Dr. Stephen Monckton (London: H. K. Lewis).—"Science."—"The Botanical Gazette."—"The American Monthly Microscopical Journal."—"The Naturalist."—"Feuille des Jeunes Naturalistes."—"The Midland Naturalist."—"Journal of Microscopy and Natural Science."—"Journal of the Health Society" (Calcutta).—"Ben Brierley's Journal."—"Report of the Mitchell Library, Glasgow," 1884.—"Results of Twenty Years' Observations on Botany, Entomology, Ornithology and Meteorology," taken at Marlborough College, 1865–1884.—"Le Monde de la Science."—"Journal of the New York Microscopical Society."—"Revista Scientifica."—"Journal of the Royal Microscopical Society."

Communications received up to 11th ult. from:—C. F. O.—G. F. H.—C. C. D.—W. H. H.—A. A.—W. G.—G. A. A.—M. S. W.—H. C. B.—J. H.—E. L.—T. M. R.—J. G.—G. A. R.—T. E. A.—E. H. R.—F. B.—A. A.—F. H. A.—A. H. S.—R. D.—M. B. W.—E. H.—W. C. C.—C. C.—H. J. G.—F. W. C.—R. M.—J. E. R.—W. A. P.—S. J. McI.—D. B.—C. H. R.—A. R. W.—A. H.—J. W.—C. P.—W. H. P.—R. A. H.—J. W. N.—E. C. B.—S. C. C.—W. S.—H. M. B.—T. W. O.—B. B. L. T.—R. W. G.—D. S.—H. M.—T. H. M.—C. A.—F. S.—H.—A. E. R.—H. P. F. G.—B. T.—G. E. C.—R. H.—S. J. W.—J. W. H.—J. M. C.—F. R. R.—G. E. E.—F. L. C.—E. A. M. W.—F. W. M.—H. W.—H. E. E.—W. T. T.—J. I.—W. S. C. T.—A. D.—J. T. T. R.—C. V. E.—E. H., &c. &c.

E.T.D. del, ad nat. Vincent Brooks, Day & Son lith.

SEEDS OF "LOVE-LIES-BLEEDING."

× 25.

GRAPHIC MICROSCOPY.

BY E. T. DRAPER

No. XVIII.—SEEDS OF LOVE-LIES-BLEEDING (*Amaranthus caudatus*).

OUR plate exhibits simply the external character and appearance of an elegant seed, as seen with a moderate power under the microscope. From this aspect the subject is introduced, to invite attention to an attractive class of easily-procured objects, showing elegance of form and colour. The microscopist, however, contemplates a seed with deeper significance, its hidden mystery, its absolute totality, an independent whole, involving an embryo lying dormant (often for years), but ready, under favourable surroundings, to start a new plant true to its species. At such a point it may be interesting to devote a few preliminary lines in an attempt to describe what may be seen of this compacted quiescence when set in action by the force of germination, and revealed by the instrument.

In a dry, intact seed, the embryo of the future plant is hidden beyond the power of observation, but when subjected to external influences alterations commence. At this stage, examination leads the imagination to what may have been the primary condition; a germ, enclosed in a simple and minute cylindrical body of dense organisation hardly presenting a trace of complicated or differentiated structures, and only when influenced by moisture and moderate heat the mysterious principle "germination" sets in; changes appear by the gradual absorption and elimination of the surrounding and protecting provision; the embryo then breaks through the integuments and acquires a distinct vascular, tubular, and cellular organisation; this process, or development, may be observed. A grain of corn, although partaking more of the character of a fruit than a seed, is peculiarly adapted for experiment; by soaking in water for a few hours germination is quickly promoted; to see the acme of interest, it must not be carried too far, in fact, *just started;* thin transparent sections cut from the centre of the grain in the direction of the axis, and placed under a thin glass cover in a drop of glycerine jelly or chloride of calcium, will exhibit developments which may be assumed to be analogous to the germination of other seeds; a minute sheath, or sac, formed by the single cotyledon, which represents the undeveloped leaves, will be seen, enclosing the plumule, the rudiment of the ascending growth; outside the sheath, the radicle, the nascent descending axis. These organs, still confined within the seed, or at least, only just breaking through the pericarp or outer skin, are sustained by the exhaustion of the albumen of which the greater part of the seed consists, stored in cells — reservoirs of nutriment, starches, oils, and other matters in varied combinations. Cuttings from grains, soaked in water, taken at successive periods, exhibit phases or progresses of development. But, from an embryological point of view, microscopical interest is lost after the initial process is past; the albumen cells then become exhausted and effete, and the minute stem and root push forth and assume the character of a plant, entirely dependent on external resources. A transverse section cut through the point of a germinating grain shows the cotyledon like a pale oval border, surrounding the minute and compacted convoluted tissues, which afterwards become the leaves of the plumule.

The gay and persistent blossoms of the somewhat weedy shrub-like *Amaranthus caudatus* (love-lies-bleeding) are prominently attractive in old-fashioned gardens; the fruit is a utricle, a seed vessel with a loose rind, or pericarp; rubbed off, or winnowed, it reveals the object, as seen in the illustration; in

colour, of delicate intermingled pinks and yellows with the embryo curved, like an annulus round the circumference of a central store of farinaceous albumen; the object well displays the hilum, or scar of union with the mother plant.

The integuments of seeds are composed of structural membranes of significant interest; after soaking, and in some cases boiling, they may be teased out, and excellent preparations secured; the disclosure of spiral tissue in the testa of the seeds of Cobœa, and Collomia, an oft-repeated demonstration, still retains its old interest; a thin particle cut from the surface, placed in a drop of water, between glasses, will disclose positive action; cells bursting, and imprisoned coils darting forth in all directions.

Of seeds, in their simple and natural integrity, as objects of beauty, may be mentioned: poppy and mignonette, showing reticulations; *Eccremocarpus scaber*, with membranous wings; this seed mounted in balsam is a fine polariscope object. *Antirrhinum majus* (snap-dragon) roughly corrugated; the seeds of the carrot have curious radiating processes; those of wild indigenous plants are always attractive, and exhibit marked peculiarities; Goose-grass, covered with equidistant hooks; Burr-reed with four ribs running longitudinally, terminating in projections, each armed with a double row of barbs; even chickweed has a spinous seed, worth looking at. As regards configuration the most striking are the reniform, and the obovate, as in the larkspur, marked with prominent irregular ridges.

The following carefully selected list of microscopic seeds, as showing peculiarities in great variety, is extracted from the "Micrographical Dictionary" (Van Voorst).

Hypericum, Lychnis, Stellaria, Reseda, Lepidium, Nigella, Erica, Anagallis, Orobanche, Linaria, Chironia, Gentiana, Datura, Nicotiana, Petunia, Sedum, Saxifraga, Capparis, Elatine, Gesnera, Begonia, Delphinium, Scrophularia, Antirrhinum, Maurandya, Sphenogyna, Hyoscyamus, Sempervivum, Silene, Dianthus, Papaver, Digitalis.

Seeds perfectly dry and clean, require little or no preparation, as opaque objects; the beauty of many, as Drosera, Hydrangea, Pyrola, Orchis, and very minute specimens, is much enhanced by mounting in balsam *in a cell*, after a washing in spirit of turpentine, in this way, the edges or any projecting parts, as hairs, spines, corrugations, hooks, &c., are within reach of the dark ground illumination, which added to condensed light from above, brings out their perfect beauty, with binocular vision, presenting a solidity eminently adapting them for artistic study and practice as models of form, colour, and shadow.

Crouch End.

A NEW volcano is said to have been discovered in or near the government of Smolensk in Russia, and to have been showing signs of activity.

ARTISTIC GEOLOGY.

FFESTINIOG AND ITS NEIGHBOURHOOD.

By T. MELLARD READE, F.G.S., &c.

[*Continued from p.* 113.]

BWLCH *Drws Ardudwy*. — We may devote a good long day to this excursion, which will, with fine weather, well repay the geological student no less than the lover of scenery. Taking an early train to Trawsfynydd on the railway to Bala, we get on to the main road from Maentwrog to Dolgelly. About two miles frcm the station, and about half-a-mile before turning off to the right, on the east side of the road, is an outcrop of the Cambrian rocks, here of a blue slaty nature, the direction of dip being from west to east, which it will be well to bear in mind. Turning off along an unfrequented road, we cross the Afon Eden by a foot bridge, and about a mile onwards we cross an extensive surface of bare rock having a dip about nine degrees north-west; but it varies, as the surface is part of an anticlinal curve. No glacial striæ are to be seen, but the smoothness of the rock may nevertheless be due to glacial action.

It may be as well here to observe that we have been walking along, and then across a valley denuded out of an anticlinal and situated at a very considerable altitude, as any one who walks from Maentwrog will find out before he gets to Trawsfynydd. This valley is a wide trough, running north and south, occupied entirely by Cambrian rocks, out of which, indeed, it has been scooped.

The eastern side is for a considerable distance bounded by a fault which must pass very near to Trawsfynydd station, though I did not see it. This elevated valley is remarkable, inasmuch as it is divided into two watersheds, the southern part being drained by the Afon Eden towards Dolgelly into the Mawddach, and the northern by the Afon Pryser, which rises in the Silurians to the east, and flows, after passing round the village of Trawsfynydd to the estuary below Maentwrog, discharging over the beautiful falls of the Rhiadr Ddu before alluded to.

From the smoothed rocks we left off at to describe the valley, there is a gradual ascent to the Drws Ardudwy, which is a wild pass between Rhinog Mawr and Rhinog Fach, two grand Cambrian mountains. As we traverse the pass, or the "gates" of the Ardudwy, we are going in a south-westerly direction. From the time of entrance between the Rhinogs to the summit of the pass, we are still rapidly ascending. Beyond the summit we may rest to survey the prospect, taking care to have a good big block of stone behind us, for the wind blows keenly through this mountain channel. Looking back, that is to the north-east, we have a sublime view of the bare and somewhat terraced flank of Rhinog Fawr. The grandeur of the scene is due to the enormous mass of rock which is almost devoid of vegetation, and the

blocks of grit scattered profusely about and around us in wild confusion.

Examining the stone, after fracture with the hammer, we find it is a bluish-grey grit, largely composed of felspathic materials and almost crystalline. Indeed, at first sight, one would take some of the Cambrian beds to be felstone, but a careful examination will show the rounded grains of which it is composed, and assure us of its clastic character. Some of the blocks which have been detached from the precipices above are well worthy of study, as the grit contains in some cases veins of slate, usually of a greenish colour, which by weathering exhibit the cleavage distinctly, though the grit is unaffected by it. In one block I counted no less than six bands of slate, all cleaved in the same direction, the intermediate grit showing no signs of cleavage. In another case the weathering brought out current bedding in the grit itself, though a more unlikely material to display this structure it would be difficult to conceive.

There is no doubt that geology tends to the enjoyment of scenery, for many years ago, before I had practically worked at the science, I visited this spot and made a sketch of the pass, approaching it from Llanbedr; but it did not yield me the same pleasure then as on my last visit, even discounting the fact that on the first occasion a horridly cold wind was blowing through the pass, and on the last the day was sunny and bright.

After lingering to enjoy this wild scenery we had to turn our faces homewards, but not before being passed by three travellers, one a lady with approved Alpine-stock, who walked briskly and in good style through the pass. I could not help admiring the swing at which they were going, and watched them as far as the eye could follow, curiously wondering in what way the scenery affected them. Their feelings, however, were a sealed book, for they looked not to the right hand nor to the left, nor heavenwards, towards the summits of the mountains. They were evidently "doing their distance," and could not be troubled with such frivolities as scenery! Still, no doubt, they expatiated on the grandeur of the scenery when they arrived at their destination,—and had time.

The sun was now getting lower in the heavens, and the Rhinogs with the range extending to Diphwys was dyeing deep purple, showing sharply in outline against the western sky. The structure was well displayed; long low curves ending in scarps taking a direction a little eastward of north, showing that the strata is not bent merely into parallel folds, but has a curvature in a minor degree along its major axis. Arriving at the Dolgelly road, we sat down to survey and sketch Cader Idris. Lighted up by the afternoon sun, the long escarpment showed every detail of its furrowed side, exhibiting a marked contrast to the forms of the Cambrian mountains we had been studying. The golden face and purple shadows of Cader were appropriately set off by a foreground of bright green turf, with a little farm-house and group of trees to the right distinctly outlined against the mountain background. Arrived at the Trawsfynydd station, while waiting for the train we had ample time to watch the soft rosy light of evening overspread the scene, while the mountains beyond the Rhinogs shone in light golden tint, intensified by the dark deep purple of the Cambrian range to the right. This was truly, though gained by considerable walking, a red-letter day.

FEATURES IN THE NEIGHBOURHOOD OF FFESTINIOG.

Next to Moelwyn, the most prominent objects near Ffestiniog are the two Manods. One is struck by the contrast of form they exhibit as compared with Moelwyn and other Snowdonian mountains. A geological examination shows that they are in greater part carved out of massive felspathic porphyry, estimated by Ramsay at 1500 feet thick. This rock, as may be seen on a smaller scale, weathers into rounded forms, the Manods being, in fact, bossy hills formed by denudation from a bed of igneous rock, ejected during the deposition of the Llandeilo beds, upon the lower beds of which they repose. These beds are altered by contact, whereas the slaty beds above are unaltered. (See section, p. 54. Memoir of Geo. of North Wales.)

An instructive example of the rounded form into which this rock weathers may be seen in a hill near the slate quarry above Llyn Morwynion, from which lake the water supply of Ffestiniog is obtained. A climb up to Llyn-y-Manod, a small tarn lying in the hollow between the two Manods, will repay the exertion. Good views over Cardigan Bay and towards Harlech Castle are obtained. The mountain is seen to be covered with angular blocks of stone, derived from its own mass. The rock weathers with a rough white crust forming with the lichens thereon a beautiful gray tint in the distance, with the faintest dash of purple therein. Underneath the crust is a reddish-brown iron stain, which no doubt is washed out of the outer skin of the stone. The talus of broken blocks are not bad climbing, being filled in between with soil and turf, but unfortunately we had not time to get to the summit. When we started on this journey, clouds and mists covered the vale, which, gradually lifting, showed the bright green vegetation bathed in the sunlight below.

(*To be continued.*)

The American Monthly Microscopical Journal for April contains the first part of a provisional key to the classification of freshwater algæ, by the editor, Mr. Romyn Hitchcock, F.R.M.S.

FERTILISATION OF *ORCHIS MASCULA.*

By Edward Malan.

[*Continued from p.* 102.]

THE *tubers*, I believe, behave pretty much as I described. Most of the plants that I have taken up in April, have been about 2 inches below the surface. In August it is exceedingly difficult to find the *tubers*, as there is absolutely nothing above ground to assist your search, and although I have frequently marked the place and position of plants in April, yet I have been disappointed when I returned four months later. You may dig, and you may dig, but nothing will you find. Why is this? Clearly the *tubers* descend; and the reason of this descent is to prevent premature germination, which, if allowed to proceed without the proper interval of rest, considerably weakens the plant of the following year. The case of the tuber that I mentioned as being deeply planted, was an experiment, and it was purposely prevented from rising, by being kept at a uniform depth of 3 inches below the surface. The result was very disastrous to the plant, but the new tubers grew better when the leaves were above ground. The drawings which I made at the time can be seen.

Lastly, as to the breaking of the stem affecting the flower of the new tuber. Here G. M. has not quoted my words correctly. Breaking the stem certainly cripples the plant of the following year, and prevents its flowering; at least, I have only observed one exception to this, and the notes that I made can be had for the asking. But I did not say that I saw a perfectly healthy plant minus its *tubers*: I said *tuber*. This rather alters G. M.'s case against me.

Now let me go out and select a plant of *O. mascula* and let me explain what I mean. [One hour occupied in finding a plant.] This one that I have found (March 9th, 1885) will just do. Clear away the soil carefully, and do not break a single root. Then proceed to vivisect the victim. Just place your knife, my classic Ajax, where it will cut sharpest, and divide the plant in half, leaves, tubers and all. There, the thing is done, and this drawing is a faithful representation of the result. We will call the *left-hand* tuber (i.e. the tuber of 1884–5) A; and we will call the *right-hand* tuber (i.e. the tuber of 1885–6) B; evidently the plant arises from A; evidently B has no independent existence as yet. Accordingly A answers to the *old* tuber of my description, and B answers to the *new*. There can be no mistake now.

Last autumn, while men were slumbering and sleeping and caring very little for this particular tuber, the silent processes of life were at work, and A took courage and started the thing going. First of all the embryo, containing the leaves and spike, germinated little by little, drawing upon A for its resources, in this the first stage of its growth. The embryo is now the plant on the table before me. How long A directly supplied the embryo I cannot say for certain, as it appears to depend very much on the moisture or dryness of the soil, but it cannot be for long, for as soon as the roots appear, the germination of the embryo is considerably accelerated, and A hardly decreases in size at all, afterwards. If you ask how I know, I reply because I have been there to see. So far, then, my remark

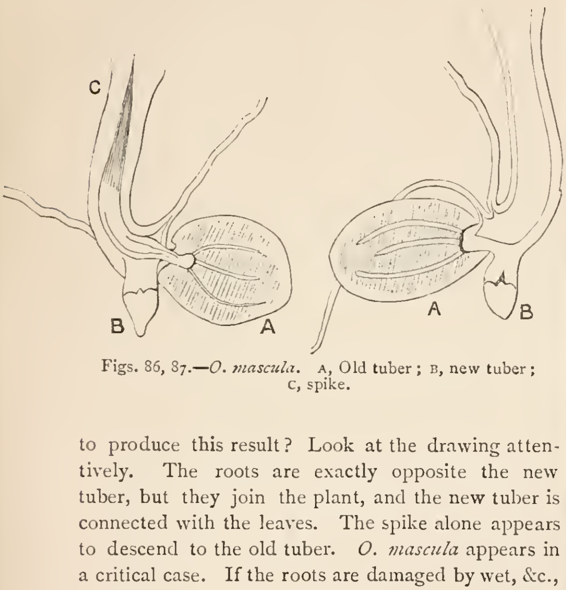
Fig. 85.—*O. mascula.* A, Old tuber; B, new tuber.

about the tuber containing a store of food *not* for the leaves and stem, is correct, I believe. The remainder of the remark must be considered next.

A glance at my drawing will show that the roots supply the leaves directly, for otherwise why should they not proceed from the base of the tuber? and the plant that I mentioned, minus the tuber, ought to have been crippled or dead. But it wasn't. Therefore my conclusion is that the leaves and

spikes are mainly instrumental in the production of the new tuber, for how could that new tuber have been healthy and plump, when the old tuber itself was nearly empty? I am aware, of course, that I cannot argue from a particular to a general case, and so I have stated my theory cautiously. I am also aware that this conclusion is opposed to my remark about the old tuber containing a store of food for the new tuber. The fact is this. I am extremely obliged to G. M. for pointing out the discrepancy in my paper, and thus compelling me to observe more carefully, and I hope that he will observe many plants during this season and help me further. The offending remark was written some time before the remainder of the article.

Then, another thing. I have succeeded, in two years, in entirely clearing the leaves of a plant of *O. mascula* of spots, so that the leaves of the plant are perfectly spotless. If the roots supplied the new tuber directly, why should not one year be sufficient



Figs. 86, 87.—*O. mascula*. A, Old tuber; B, new tuber; C, spike.

to produce this result? Look at the drawing attentively. The roots are exactly opposite the new tuber, but they join the plant, and the new tuber is connected with the leaves. The spike alone appears to descend to the old tuber. *O. mascula* appears in a critical case. If the roots are damaged by wet, &c., the plant has to feed on the old tuber, and the spike suffers: if the embryo starts too soon, or remains too deeply buried, the new tuber suffers. If the spike is broken, the old tuber doesn't suffer, but somehow the flower of the following year is affected.

There were two misprints in my article (vol. xix. p. 52) which have not been noticed. In one place, *column* was written for *collum*, and in another, *skin* for *stem*. I also made the mistake of calling the *embryo* the *plumule*.

Dr. Erasmus Darwin (*Botanic Garden*, Canto iv. 37) says that the seed of *O. mascula* only ripens when the tuber is picked off. Then how can this occur in nature, under ordinary circumstances, unless some pitiless surgeon of a slug amputates the new tuber?

I must apologise for occupying so much space, but I trust the attention focussed on this interesting plant will be excuse enough.

THE AGE OF THE MALVERN HILLS.

By J. Walter Gregory.

THOSE members of the fraternity of the hammer who have the good fortune to visit the Malvern Hills, will find themselves in a land rendered classic to geologists by the researches of Murchison, Ramsay, Phillips, Horner, Symonds, Brodie, Salter, Holl, not to mention a host of minor names, and in a district into whose varied features as many interesting geological problems and strata are compressed as into any area of England of similar extent. The fossiliferous Keuper Marl and osseous conglomerate of Pendock and Moorcourt, the splendid sections of the Upper Silurians, West of Worcestershire Beacon, the Mayhill sandstone in its typical locality, the Ludlow Bone bed of Hale end, the noted Permian

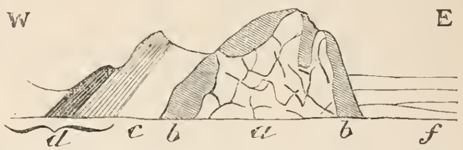


Fig. 88.—Diagrammatic section of Malvern Hills. *a*, syenite; *b*, gneiss, &c.; *c*, Hollybush sandstone; *d*, Silurian; *f*, Trias.

breccia of Berrow and Bromesberrow, the Hollybush Sandstone and Black Shales with their lavas of Coalhill and Fowlett's Farm, the Old Red Sandstone of Ledbury, and last but not least the physiography of the Woolhope ellipse, are all in the immediate neighbourhood.

But to any geologist above the rank of a mere fossil collector, there is one point of surpassing interest on which he is sure to commence, and to which he is tolerably sure to return. However interested he may be in the inversion on the west of the hills, however fascinating he may find the study of the denudation of Woolhope, and the comparison of the wooded undulating Silurian strata of the west with the fertile Keuper plain that stretches away on the east to the Severn, the question of the age of the rocks constituting the chain of hills is sure to retain most of his attention.

In a series of articles on the Pre-Cambrian Rocks of England and Wales, published in Science-Gossip in 1883, by Mr. W. W. Watts, B.A., F.G.S., the author commenced with a brief notice of the Malvern Hills, which he boldly claimed as Archean. I propose in the present article to see what evidence can be adduced in favour of such a conclusion, to

discuss its value, and finally to summarise the arguments which led Murchison to the opinion still retained by the Survey.

First, let us briefly examine the geological structure of the range. The hills consist of a central ridge of Syenite with much syenitic and granitoid gneiss and diorite: on each flank are beds of schist which become more and more brittle and contorted as we approach the syenitic nucleus which is exposed at many points, as at Keys End Hill and the valley of the Whiteleaved Oak, and was passed through in the Malvern and Ledbury Tunnel.* Resting very unconformably upon these schists, we find on the west of the Keys End Hill, the Hollybush Sandstone, the basement bed of which contains pebbles of the igneous rocks derived from the hills, the presence of which proves that the sandstone is the more recent formation. From its fossils (*Trachyderma antiquissima*, Salter, *Serpulites fistula*, Holl, *Obolella Phillipsii*, Holl, *Lingula squamosa*, *Scolithus* and four undetermined species), Dr. Hicks has correlated it with his Festiniog beds (middle Lingula Flags). This is the oldest fossiliferous bed in the district, and it limits us to two possible theories as to the age of the hills; they may be Archean, or they may be Lower Cambrian.

With the above sketch in, at any rate, its main points, most geologists would agree; but here the two paths diverge, the old school holding that the hills were formed by the metamorphism of Longmynd rocks into gneiss and schist by the intrusion of the underlying syenite; the Archeanists maintaining that the rocks were deposited in some peculiar manner in Pre-Cambrian times.

The latter school found their case mainly on the three following propositions: 1st (which would only be advanced by the more thorough-going members of the school) that as no Post-Archean regional metamorphism is possible, these rocks being metamorphic are consequently Pre-Cambrian; 2nd, that even if we admit the possibility of Post-Archean metamorphism, the period of time between the Longmynd and the Hollybush Sandstone would be insufficient for the deposition of these strata, and their alteration into gneisses; 3rd, that the Malvern rocks are similar to those from other Pre-Cambrian areas.

Let us briefly examine these arguments. The truth of the first proposition most geologists would deny *in toto*; and while admitting the possibility that many areas now considered metamorphosed Cambrian may prove to be Archean (as has recently been done by Geikie,† with the "Newer Gneiss" of the Highlands), when one remembers how many instances have been described of the passage of sedimentary into schistose and gneissose rocks, and

* Symonds and Lambert on Strata exposed in Malvern and Ledbury Tunnel. "Quart. Journ. Geol. Soc." vol. xvii.
† "Nature," vol. xxxi. pp. 29–34. (Nov. 13.)

that its most enthusiastic adherents only claim that it is supported by negative evidence—one cannot but receive such an argument with great caution. Of such instances are the fossiliferous schists of Christiania,* the Liassic Mica schists of St. Gothard,† and the passage in the Pyrenees so well described by Fuchs,‡ of clay slate through Fruchtschiefer chiastolite slate, andalusite schist, and Mica schist into gneiss.

The objection of lack of time cannot be accepted when we remember that during the Lower Cambrian era were deposited over 500 feet of the Menevian, the 6000 feet of the Harlech Grits and the 20,000 feet of the Longmynd: even if the gneiss and schists of Malvern represent the whole of the Longmynd, we have a period represented by the deposition of 6500 feet, and this would certainly seem ample for the elevation of so small a chain of hills, when we bear in mind that the gigantic ranges of the Alps, Andes, and Himalayas were all elevated during the much shorter system of the Miocene.

In replying to the third argument, that from the structure of the rocks, I need not here discuss the possibility of correlating rocks by their mineralogical composition. We need only note the great differences as pointed out by Murchison between the fissile, fine-grained syenitic gneiss of the Malverns, and the thick-bedded coarse gneiss of the Highlands, which differ in every respect save in the abundance of hornblende. Nor do these rocks more resemble the so-called Pre-Cambrian of St. David's. Dr. Callaway, whose fairness and moderation in a controversy that has not been lacking in personalities command our respect, and whose able and lucid series of papers on the Malvern Hills, the Wrekin, Anglesey, and the Highlands, have placed him in the front rank of English Archeanists, says: § "The Malvern Series is almost exclusively gneissic, foliation is well marked, and hornblende abounds. In the St. David's area gneiss is absent." He further points out the absence at the latter place of schists, as the so-called "quartz schists" of Hicks are really granitoids and quartzites.

(*To be continued.*)

GOSSIP ON CURRENT TOPICS.

By W. MATTIEU WILLIAMS, F.R.A.S., F.C.S.

THERE appears to be fair reason for hoping that the cattle plague will become, like small-pox, an historical disease. Pasteur's method of vaccination has been successfully applied in India to elephants, horses, asses, cows, buffaloes, and sheep. I say "like small-pox" because the effect of vaccina-

* Reusch, "Upper Silurian Fossils in Metamorphic Rocks of Christiania. Universitets Programm, 1882."
† Ball's "Introduction to Alpine Guide," p. 74.
‡ C. W. C. Fuchs, "Neues Jahrb. für Miner," 1870, p. 742.
§ Callaway, "Quart. Journ. Geol. Soc." vol. xxxvi. p. 538.

tion is not that of a complete preventive of disease, but rather an alteration of its character, a conversion from a malignant horror to a mere outbreak of pimples. Instead of being the most fatal and the most filthy of all diseases, the small-pox, as it appears in vaccinated patients, has become so mild that there are fanatics who actually describe it as a beneficent purifier of the blood. I have heard a lady who is an eminent agitator and a healing medium, but otherwise fairly intelligent, describe a case of chronic life-long suffering as cured by a "refreshing outpour of small-pox." On the other hand, I have witnessed the horrors of malignant small-pox, a whole family—father, mother, and unvaccinated children—all in one room, and all in a condition of superficial putrescence, a sight and stench too horrible for description. This is what Jenner and his contemporaries familiarly beheld, but which the lady above-named and those who are similarly infatuated have not yet seen, but will see presently in Leicester if the agitation makes much further progress.

Pasteur's prophylactic for the cattle plague and rabies appears to act chiefly in effecting an "attenuation" of the disease by means of attenuated virus. The demonstration of the efficacy of his attenuation of hydrophobia is difficult on account of the rarity of the disease and the necessary limitation of experimental proof, but when cattle plague settles in a district and threatens an extermination like that which occurred in the Cheshire cheese country twenty years ago, nothing is easier than to vaccinate one half of a given number of cattle, and expose them and the other half to the same conditions of infection, and watch the result. This has been done in India.

In last month's "Journal of the Chemical Society" is printed a paper read at the Society (with the usual omission of the date of reading) by Dr. Peter Griess and Dr. G. H. Harrow, on "The Presence of Choline in Hops." This substance is otherwise named sincaline, neurine, and amanitine. It is called neurine because it is found in the brain. This name and its existence there have promoted fanciful theories concerning its influence, similar to those popularly entertained concerning the mysterious or quasi-spiritual potency of phosphorus as an element of brain-matter.

The writers of this paper find this neurine in hops and beer, and conclude their paper as follows:—"Whether the circumstance that choline is present in beer has any physiological significance, is a question which we are not in a position to decide; it is, however, interesting that this never-failing and peculiar constituent of the brain-substance should also be present in one of our most important articles of diet."

I will not stop to discuss the question whether beer is "an article of *diet*." I think it better described as a drug, but must protest against the description of this many-named substance, the choline, or neurine, or sincaline, or amantinine, as a "peculiar constituent of brain substance." The authors of the paper have misused this word "peculiar." It signifies exclusiveness, and thus used implies that the substance only exists in the brain; whereas, as they state in the early part of their paper, it is "a constantly occurring constituent of several parts of the animal body" and "it has also been proved to exist in some plants." Its various names indicate various sources from which it has been derived. Therefore we need not lower the vitality of the mucous membranes of our digestive organs by drinking tonic hop bitters, nor stupefy ourselves with beer, in order to nourish the brain. *Cervelli fritti* (fried brains) is a standing dish at Italian restaurants. I met a man at the *Lepre* in Rome who ate that dish there daily in order to strengthen his intellect. The result by no means indicated that even this very direct consumption of neurine was efficacious.

Another paper read by Mr. H. Brereton Baker at the same society is very interesting and important. As Mr. Baker states, his researches were suggested by some recent experiments of Mr. Harold B. Dixon (Philosophical Transactions, 1884, part 2), showing that a highly explosive mixture of carbonic oxide and oxygen is not explosive when dry. We are so accustomed to regard water as antagonistic to combustion that the mere suggestion that ordinary combustion cannot take place without the help of water appears an extravagant paradox. Nevertheless this appears to be the case. The experiments of Mr. Dixon and those of Mr. Baker concur, so far as they go, in showing that there can be no fire without water. The difficulty in making these experiments is that of getting rid of the water. "Water, water, everywhere" expresses a great chemical truth. It holds on with desperate tenacity to the air we breathe, and every gas we produce in our laboratories. I need not here state the particular methods adopted by Mr. Baker to dry the oxygen used in his experiments. They were the best known, and the drying was continued from one to sixteen weeks.

He subjected purified charcoal and phosphorus to the action of the dried gas, and to ordinary oxygen containing its usual supply of aqueous vapour. These placed in comparison tubes were equally heated. The general result was that in the moist oxygen complete combustion of the carbon and the phosphorus occurred, with brilliant outflash of the latter. In the dried oxygen there was no visible combustion, and examination of the residual gas showed that all the moist oxygen had combined, but only a small and varying proportion of the dry oxygen.

There is fair reason to infer that this small amount of oxidation would not have occurred had the gas been perfectly dry, a condition at present unattainable.

Santini ("Gazetta Chimica Italiana," vol. xiv. p. 274) has already shown that the flame of hydrogen assumes all the colours of the spectrum, and now replies to the objection that this coloration is due to impurities of the gas, as at first prepared, by making it from potassium formate heated with potash. He still observes the same phenomena with this. To show these colours, the hydrogen should be collected in a bell jar about 8 inches long, and 2 inches diameter, which should be then held with its mouth downwards, a light applied and the vessel gradually inclined. A flame pours upwards in which all the prismatic colours may be observed as the jar approaches the horizontal position. Carbonic oxide, sulphuretted hydrogen, methane, and vapours of alcohols, ethers, &c., display similar colours.

In the current volume of "The Proceedings of the Royal Society," W. N. Hartley states that the sensitiveness of the spectrum in detecting magnesia is practically unlimited; that it is possible to obtain a definite magnesium spectrum from a spark carrying only a one thousand millionth part of a milligramme, (a milligramme is a little more than $\frac{15}{1000}$ of an ounce). Also that a solution containing one part of magnesia in ten thousand million parts of water displays two of the characteristic lines of magnesia. These quantities are inconceivably small, but still the substance is outspread and continuous; no physical indication of discrete molecules is displayed. Some of my readers may know that I am a heretic in reference to the actual physical existence of any ultimate atoms or molecules, regarding all the speculations concerning the limits of littleness as vain and worthless, quite as vain as discussing the boundaries of space.

A very interesting and important paper was recently read at the French Academy of Sciences, (Comptes Rendus, vol. xcix. p. 1072) by J. Thoulet, describing experiments which justify the conclusion, that an attraction is exerted between a dissolved salt, and an insoluble solid immersed in the solution, and that the amount of this attraction varies with the surface of the solid. Thus when marble, kaolin, quartz, or other solid, is immersed in a solution of barium or sodium chloride in which they are chemically inert and insoluble, they nevertheless disturb the solution, and render it weaker by effecting a deposition upon themselves of some of the dissolved salt.

Important practical consequences follow from this. One of the oft-repeated fallacies of the half-learned, but not of the unlearned, is that of stating that a filter can only remove mechanical impurities from water, that it cannot remove matter which is there dissolved. This statement has been disproved by experiment. By repeated filtrations sea water may be rendered less and less salt, until it becomes nearly if not quite tasteless. This fact has hitherto been rather puzzling, but is now readily explained by the adhesion of some of the salt to the filtering medium. It should be, however, understood, as a matter of course, that in order to obtain this result, fresh filtering material (sand for instance) must be used at each filtration, since the sand thus used ultimately takes up its utmost attainable supply of salt, and then may rather give some back to fresh water than take any more away from salt water.

As far back as 1878 similar results were obtained by Bayley, but in a different manner. He let fall upon the white blotting-paper used for filtering, drops of various solutions, and observed that generally the salt remained near the centre, and that a ring of water extended round this. By using solutions of metallic salts which became blackened by hydrogen sulphide, he was able, by simply applying this reagent, to obtain a picture of the diffusion, and produced similar pictures by staining the blotting-paper with turmeric or litmus, and then adding allkaline or acid solutions which change the colour of the stain. The greater the dilution, the broader the water ring surrounding the coloured spot and indicating the position of the salt. Concentration of the solution, heat, and looseness of the texture of the paper, increase the mobility of the solution, i.e. the distance to which the dissolved matter may stand before the water leaves it. The mobility of different salts varies, and in mixed solutions they act independently of each other.

These results have been recently confirmed by J. U. Lloyd ("Chemical News," vol. li. p. 51), who modifies the experiments by dipping chips of blotting paper into various solutions, and observing how far the substances in solution climb up the paper before they are left behind by the water. Various solutions were thus tried; in some cases, as with very dilute solutions of ferric sulphate, the salt just creeps up above the surface of the solution, while the pure water travels to the end of the paper (five inches). A concentrated solution of the same travels with the waters, no separation taking place. Such a solution of this salt is like a syrup.

When solutions of ferrous sulphate, copper sulphate and ferric sulphate were mixed, each salt showed a limiting line at the same distance above the solution as when tested separately and of corresponding strength; the ferrous sulphate travelling farthest, the copper sulphate next, and the ferric sulphate lagging behind. Other salts behaved in like manner. Even sulphuric acid is separated from water when the solution is dilute; water quite free from acid passing onwards. By bending the blotting-paper over at a height above the reach of the salt, and allowing the further end to hang below the level of the solution, a perfect filtration of ferric sulphate was effected, drops of water free from iron salt falling from this lower end. Quantitative experiments were made on this and other solutions, showing their relative distances of travelling in solutions of measured strength.

LEAVES FROM MY NOTE-BOOK FOR 1884.

By A. Kingston.

IN transcribing the following extracts from "Leaves from my Note-book for 1884," it is scarcely necessary, perhaps, for me to caution the reader against expecting anything very profound, or anything directed to a special branch of enquiry; still less will he expect them to contain much in the way of novelty. They are the casual observations made, and jotted down as they were made, in leisure moments; and their only merit perhaps will be that they may possibly suggest, here and there, a line of inquiry to others having more ability and leisure to follow it to a profitable issue.

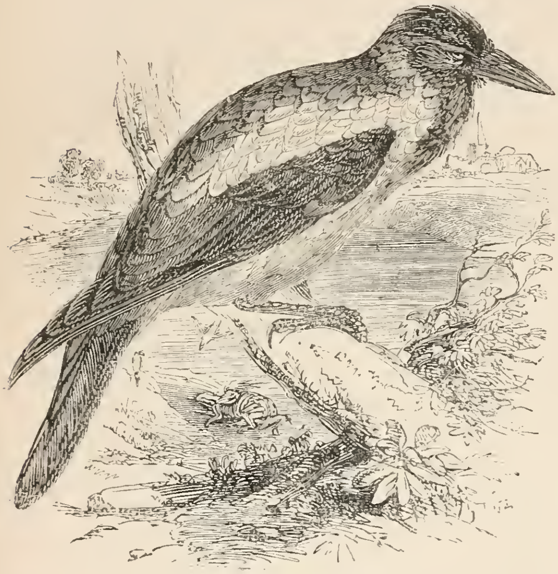


Fig. 89.—Royston Crow.

The opening days of 1884 were well calculated to stimulate observation in many directions. The close of 1883 had left such a legacy of early promise as is rarely witnessed on New Year's Day. In the vegetable kingdom, flowers enjoyed almost a second summer. Many of the yellow-flowered species of the Compositæ among wild flowers, and many annuals in the garden had flourished far beyond their appointed time. Gardens were gay with wallflowers, marigolds, daisies, and pansies, and other favourites. The skylark and thrush had vigorously warbled in the new year, and the industrious little honey bee (*Apis mellifica*) was busy making adventures on its own account at an abnormally early date. Some evidence, too, was forthcoming on the subject of the hardihood of one or two of our hibernating lepidoptera. The hardiest of all proved to be the common small tortoise-shell butterfly (*Vanessa urticæ*), several specimens of which came under the observation of the writer during the first ten days of January, stimulated by the atmosphere of a warm room, into a vigorous flight. I may add that next to the tortoise-shell in hardiness among the hibernators, comes, apparently, the fine old peacock butterfly (*Vanessa Io*).

The Royston, or hooded crow (*Corvus cornix*), as it is seen in its migrations southward, has so distinctly the opposite of the gregarious habit of the rook, that I was somewhat surprised to notice, during January, a little community of half-a-dozen of them together, and showing an unusually sociable disposition. This somewhat remarkable member of a familiar ornithological family having enjoyed its local designation for centuries, has, I suppose, a fair claim to the name by which ornithologists and naturalists have for so long recognised it.* It could of course only have derived this local name from the fact of its attachment to the heathy country about Royston, and of its not going much further south in its winter migration. This, however, is not absolutely conclusive evidence of its claim to the title, for in the writer's birds'-nesting days, it was commonly known as the "Dunstable crow," in the neighbourhood of the chalk ridges of the Chiltern Hills, where its peculiar plumage was occasionally recognised. Whether this interesting corvus is likely to preserve its local claims and specific distinction, as it has done in the past, may perhaps be doubtful; for Mr. Henry Seebohm, a great authority on ornithological questions, and well versed in the habits of migratory birds, makes out a strong case against the Royston crow for its disposition to interbreed with the carrion crow and other members of the family. The opinion of so accurate an observer is of course entitled to the highest respect, and yet it is not a little singular that the present representatives of the hooded crow, as they are caught in the neighbourhood of Royston Heath, are as distinctly specific as any of their predecessors, with the same distinct light grey markings as of old, and no perceptible traces of hybridisation. Indeed, I am informed by Mr. Norman, a naturalist, whose business of taxidermy, and that of his father before him, has for a period of sixty years enjoyed a more than local repute, that although many specimens of the local and general *raræ aves* have passed through their hands, yet during the whole of that period only one specimen of the hooded crow has ever come under their notice showing traces of hybridisation. With this there was the uncertain element of its being a young bird; but on being submitted to Mr. Gold, of London, it was pronounced by him to be a hybrid, and the result of interbreeding between the Royston and carrion crows. This specimen is now in the collection of Lord Bray-

* Since writing the above, I find that this local name is given to the bird in the Rev. Samuel Ward's "Natural History," 1775; the earliest mention I know of.

brooke at Audley End. With but this solitary piece of evidence in so long a period, my informant naturally asks, "Where do the hybrids go, if there is such an interbreeding?" The point is one that I must leave to those more competent to deal with it. It is not likely, however, that such an accurate and patient observer as Mr. Seebohm would countenance such a theory without the fullest justification; but if the carrion crow is generally as rare as it is now becoming in the home counties, his local namesake, if he persist in his ways, will have to seek an alliance with the more numerous rook family. But common fairness compels me to admit that, at least, as he is seen in his winter quarters, *Corvus cornix* may fairly claim that his family escutcheon is comparatively untarnished, and that he can boast the same bold markings and motley plumage as of old.

Until the opening days of April, vegetation went forward with leaps and bounds. In the almost summer sunshine of the third week in March the brimstone butterfly (*Gonepteryx rhamni*), the peacock, and tortoiseshell, sunned themselves for a little day, and a very little day it proved to be, for, having regard to what had gone before, and to what followed, the month of April was quite phenomenal. The most patient observer could find nothing fresh to chronicle between the first and last weeks of the month. Rarely has there been such a notable instance of the effect of clouds upon temperature and in protecting the young fruit crops from the mischief of a sudden radiation at this season of the year, or of the disastrous results which may follow upon the sudden disappearance of clouds. Until the 18th of April the nights for some time had been very cold, but fortunately so, for the gardener and fruit grower welcomed the solid blanket of cloud. But on that night the clouds "rolled by" with a vengeance, leaving an exceptionally brilliant starlit sky, with twelve degrees of frost, and the loss, in a single night, of many thousands of pounds to the fruit growers in the one district of the south of Cambridgeshire alone. The effect of this, and the frosts which continued with almost equal severity until the 24th, was also felt in other directions. Upon the budding horse-chestnut tree it was especially noticeable, the leaflets being shrivelled up and blackened as if scorched by fire, and the flower spikes in many cases never attained their wonted splendour. Previous to this sudden check the season had been remarkably forward, as the following early entries for flowering plants, &c., will show: *Corylus Avellana* (hazel), Jan. 12; *Ranunculus ficaria* (pilewort), Jan. 25; *Tussilago Farfara* (coltsfoot), Feb. 12; *Ulmus montana* (wych-elm), Feb. 20; *Draba verna* (whitlow grass), Feb. 28; *Prunus spinosa* (blackthorn), March 13; *Stellaria Holostea* (greater stitchwort), March 25. In most cases these and other entries were nearly a fortnight in advance of their mean dates for flowering in Hertfordshire.

Whenever a season sets in with unusual mildness, as did that of 1884, every figure in the usual pageant and retinue of spring is, in England, expected to follow suit, regardless of consequences, and so the competitive spirit which seeks to get the earliest green peas into Covent Garden sets up a craze for nightingales and cuckoos! When, therefore, the year 1884 opened in such a phenomenal manner, everybody thought the nightingale ought to come a month in advance as well, and come accordingly it did in the imagination of quite a number of persons. The first record, or report, of the singing of the nightingale came, I believe, from Surrey, about the third week in March!

Another instance was related to the writer, of one singing vigorously at Hitchin, Herts, about the 25th of March. Notwithstanding the fact that Hitchin claims to be a favourite spot for the nightingale, and can even boast of a "nightingale road," I could not help doubting the identity of this Lady-Day nightingale. Unfortunately, however, the circumstance was related by a friend of the writer, and therefore common courtesy obliged me to admit that that particular nightingale did sing on Lady-Day, but I am afraid that, as in the case of Waterton and the hooting white owl, I had a lingering prejudice against admitting that any other nightingale ever sang, in this part of England at least, as early as Lady-Day. Perhaps I may be wrong, though an observant octogenarian informs me that for the last forty years he has never known the arrival of the nightingale—the first singing of the nightingale—to happen in the neighbourhood of Royston (near Hitchin), but very little before or after the 10th and 21st April respectively. White, in his "Natural History of Selborne," I believe, gives a wider margin—between the 1st of April and the 1st of May. The mean date for the nightingale for Hertfordshire, arrived at by observations at several stations in different parts of the county, is April 14th. As a matter-of-fact the nightingale was not heard, as far as I could ascertain, in the district from which I am writing until about April 24th last year, the cuckoo being observed on the 26th, and the swallow on the 27th, all three being about ten days after the mean dates obtained by the Herts Natural History Society. Probably we are not giving sufficient credit to the instinct of our feathered summer visitors in supposing that they must be influenced by the passing variations of our seasons as much as we are ourselves, and it may not be far wrong to assume that insect-feeding birds regulate their migratory movements on safer lines than the caprices of an English spring; that their guiding instinct is the perception of increasing length rather than temporary "strength" of days. Even if such a rule should occasionally play them false, and occasion temporary suffering on arriving on our shores, yet it cannot be denied that they have on their side the inevitable laws of the universe, the

perception of which, treasured up and increasing, generation after generation, into the stream of hereditary tendency, which we call instinct, is the *summum bonum* of the migratory bird's philosophy.

(*To be continued.*)

HOLIDAY RAMBLES

THROUGH WIGTONSHIRE.

By G. Claridge Druce, F.L.S.

At the request of the able recorder of the Botanical Record Club of the British Isles (Dr. F. Arnold Lees), I undertook to visit Wigtonshire in order to form a list of its plants, since only a few of the rarer plants had been recorded by the late Professor Balfour when on a tour round the Mull of Galloway. From its western position and the frequent "Mosses" marked on the map, and perhaps biassed by my experience in Western Ross, I looked forward to a wet relaxing atmosphere and boggy walking, over flat tracts of sphagnum, with not even hilly prospects to brighten the dull moors of the uninteresting country; but the guess, if ingenious, was certainly wrong. I found, on alighting at the Newton Stewart Station, little to tell me what county I was in; and setting out for a walk by the Cree side, the first hundred species noticed contained scarcely one but what are ubiquitous plants occurring in every county. Eventually *Œnanthe crocata* raised a suspicion of a western flora, which the occurrence on the dry rocky banks by the rail-side of *Lepidium Smithii* also supported. On the west there were slight eminences of dry rocky ground on which *Jasione montana*, *Sedum Anglicum*, and *Aira caryophyllea* were to be found; on the east, fields sloping towards the river Cree,—a broad shallow stream, beyond which on the Kirkcudbright side rose the Cairnsmore of Fleet, 2300 feet elevation. About a mile below Newton Stewart, on a clayey bank by the river, occurred *Cerastium holosteoides*, Fr.; the specimens varied with the stem having the typical lines to a more diffused pubescence; but the biennial growth and larger flowers well distinguish the plants from other forms of *triviale*, although the tidal river may have been the primary cause in the development of the characteristic peculiarities. (Afterwards we found it in a similar locality on the Kirkcudbright side.) The roadside yielded great quantities of Burdock (*A. minus* and *intermedium*), and at intervals *Hypericum dubium*, which seemed to be the common St. John's Wort of Wigton.

Carsegown Moss was the first piece of bog-land visited, and it soon showed a great difference from the Ross-shire bog. First, the great paucity of sedges was remarkable, *muricata*, *vulgaris*, and *glauca* being the only ones seen; and the absence of *Juncus squarrosus* was equally striking, but there was a profuse growth of *Scirpus cæspitosus* and *Luzula campestris*, with *Juncus conglomeratus*; and trailing about the sphagnum patches occurred *Vaccinium oxycoccos*, or the pretty *Andromeda*, with both *Drosera Anglica* and *rotundifolia*. *Pinus sylvestris* looks native on the Moss of Bree.

The Bishop burn was next visited, but the stream had recently been cleared out, so very little was found. However, in a heap of vegetable matter collected about a bridge, *Potamogeton rufescens*, *prælongus*, and *Zizii* were picked, with *Callitriche hamulata* and *Myriophyllum spicatum*. The meadows here were full of *Carum verticillatum*, a typical Wigton plant; and in a little patch of marshy ground, between Penninghame and South Barbucham, *Carex pulicaris*, *flava*, *dioica*, *stellulata*, *panicea*, *Hornschuchiana*, with *Scirpus setaceus*, *Crepis paludosa*, *Orchis incarnata*, *Habenaria viridis* and *H. chlorantha*, occurred. (*H. bifolia* was not seen in the county.) *Sparganium affine* was also found in the Bishop burn, and *Carex vesicaria* by its side, as were also the willows *S. rubra*, *viminalis*, *ferruginea*, *caprea*, etc. In the river Cree close to Newtown, *Myriophyllum alterniflorum* is plentiful, and *Asplenium Trichomanes* abounds on the bridge.

Epilobium obscurum is the most plentiful willow-herb of Wigton. About Barbuchan *Erica cinerea* occurred: it seems rare, *Tetralix* and *Calluna* being the heaths of the county. *Pinguicula vulgaris*, not common, and *Eriophorum vaginatum*, also occurred here, as did *Athyrium Filix-fœmina*, var. *convexum*, and in a little plash of water *Chara fragilis*, the only one of its genus seen in Wigton. Altogether the result of the first day's walk from Newton Stewart to the Moss of Cree, and back by Penninghame, was a list of over 300 species.

The next day's work was by train to Wigton, walk thence to Kirkinner, and by Orchardton Bay to Garliestown, the latter place a small port, which the local guide states is remarkable "for its extensive sawmills, which give employment to sixteen men." By the Bladenoch side about Wigton, *Glaux*, *Triglochin maritimum*, *Cochlearia*, *Armeria*, *Juncus Gerardi*, *Sclerochloa maritima*, *Carex vulpina*, *Scirpus maritimus*, *Triticum acutum*, &c. were seen. By the rail-side, along which I walked to Kirkinner, occurred *Atriplex deltoidea* and many forms of *Trifolium repens*, especially one with foliaceous calyx. Near Baldoon *Epilobium hirsutum* for its first and last record occurred; and in the pond at the Mains, *Potamogeton crispus* and *pusillus*, *Phragmites*, &c. *Papaver dubium* and *Argemone*, with *Filago Germanica*, *Arenaria serpyllifolia*, and *Linaria minor*, were on the rail-banks. *Lamium intermedium* was frequent in garden ground at Kirkinner. In Orchardton Bay were *Salicornia herbacea*, *Statice Limonium*, *Festuca oraria*, *Spergularia marginata*, &c.; and *Convolvulus sepium*, *Lamium amplexicaule*, *Valerianella dentata*, *Agrimonia*, *Conium*, *Urtica urens* occurred on

cultivated land about South Balfern. In plantations about Stewarton occurred *Erythræa Centaurium*, *Oxalis*, *Hierac. vulgatum*, *Blechnum* and *Adiant. nig.*, both very rare, *Myrrhis* abundant; and on the shingle at Garliestown, *Atriplex Babingtonii*, *Sedum acre*, &c. A short walk from Newton in the evening to the Moss of Shin yielded a luxuriant form of *Triodia decumbens*, a dark glumed form of *Carex curta*, near *alpicola*, *Carex ampullacea*, *binervis*, *pilulifera*, *Gnaphalium dioicum*, *Juncus squarrosus*, *Nardus stricta*, *Salix pentandra*, *Menyanthes*, *Comarum*, *Carex pallescens*, etc. Altogether this day added 80 species to the previous list.

(*To be continued.*)

for this service, but its immensely prolific nature adds another qualification.

It has been calculated that one female fly is capable of producing twenty thousand young, thus enabling it to efficiently perform its appointed sphere of usefulness. It is ovoviviparous, and "Redi has ascertained, the larvæ will in twenty-four hours devour so much food, and grow so quickly, as to increase their weight two hundredfold! In five days they arrive at their full growth and size, and it is a remarkable instance of the care of Providence in fitting them for the part they are destined to act, for if a longer time was required for their growth, their food would not be fit aliment for them, or they would

Fig. 90.—Teeth of *Sarcophaga carnaria* (chequered blowfly). × 330 diameters.

TEETH OF FLIES.

THE CHEQUERED BLOWFLY, (*SARCOPHAGA CARNARIA*).

By W. H. Harris.

No. V.

FOR the removal of dead and offensive matter, few insects can compare with the creature from which the present illustration is taken. It is one of the very busy army of unpaid scavengers, rendering to mankind an indirect but nevertheless useful service. Not alone in the matter of diet is it specially adapted

be too long in removing the nuisance it is given in charge to them to dissipate" (Kirby and Spence). It is a large and rather handsome fly. The thorax is marked with four longitudinal stripes of a silvery grey tint, while the abdomen has the appearance of alternately being black or grey in patches, according as the light falls on the creature. Swift in flight, its musical hum is the announcement of energy, and it thus eloquently proclaims it has no time to waste in idleness or ease, hence it is a rather difficult fly to capture.

The teeth forms a very compact group. They are less numerous than in some other members

of the flesh-eating tribe. They consist of primary, secondary, and third rows. There are nine teeth in the primary row, seven in the secondary, and four in the last set, the whole forming an arrangement which can be well expressed in the following formula, viz. 1, 2, 3, 3, 3, 3, 2, 2, 1. There is scarcely any difference in the width of the main teeth from base to apex, but they are decidedly more deeply cleft than in *Musca vomitoria.* They are tolerably strong, breaking with a clean fracture if unduly pressed, and in colour they are a deep amber.

Fig. 91.—*Lindsæa flabellulata*, Dry.

Fig. 92.—*Lindsæa heterophylla*, Dry.

Fig. 93.—*Adiantum caudatum*, Hk., and *Adiantum flabellulatum*, Linn.

SOME FERNS OF HONG-KONG.

By Mrs. E. L. O'Malley.

[*Continued from p.* 106.]

Gen. IV. Blechnum, Linn.

(*Hard-fern.*)

Once more we meet with a genus of world-wide distribution.

The species so common in Hong-Kong and on the Peak is *B. orientale*, or hard fern of the east. Travelling round the world we shall find almost the same in the western tropics. There the species is called *B. occidentale*, or hard fern of the west, and, perhaps, revisiting our native land, one of the commonest objects in English heaths and in Scotch glens is *B. boreale*, a hard fern of the north.

B. orientale, Linn., is easily recognised if the sori are developed.

Down the centre of each of the long straggling pinnæ (the frond is simply pinnate) a row of sori on each side of the midrib seems sometimes to compress the fertile leaf; the indusium or covering runs parallel, and outside between the sori and margin of the leaf. The lower pinnæ are smaller than the upper, reduced from six or eight inches, to an inch or half-an-inch in length.

Blechnum is mentioned by Dioscorides, a Greek botanist. The name Blechnon seems to mean simply "a fern." The English name speaks truly of the nature of the plant. It is longer lived, and more able to resist an adverse soil and climate than is the case with ferns in general.

Gen. V. Lindsæa, Dry.

The formation of the indusium in Lindsæa is peculiar, and must not be confounded with Pteris. It is, in fact, exactly the reverse. It is attached to the leaf-edge, not at, but below the margin, and runs the length of the frond or pinnule. When the seed is mature the indusium is detached, not below, but at the margin, and the sori appear plainly.

Three species are common. None are large plants. *Lindsæa ensifolia*, Sw., is the largest and rarest.

It is in habit and growth like Pteris, simply pinnate with pinnæ from four to ten inches long, and the general aspect straggling.

L. flabellulata, Dry., has little half-round pinnæ ranged up both sides of the stalk, which is occasionally eight or ten inches in height.

L. heterophylla, Dry., is bipinnate, that is the pinnæ are pinnate again, and these secondary divisions are either half round or pointed. This species may be said to be a combination of the other two.

Lindsæa may be distinguished from Adiantum as the fructification is continuous and not in patches. Ensifolia means sword-shaped; heterophylla, irregular-leaved; flabellulata, like a fan.

Gen. VI. Adiantum, Linn.

(*Maiden-hair.*)

Who does not know a maiden-hair fern, so called from the black delicate stalk peculiar to every member of the family? The well-known form, however, is not found among the commonest species in the island. The name "Adiantum" was given to the fern by Pliny, and means "not to be wetted," from the faculty the leaves have of throwing off the drops of water, under which they love to grow.

Three species are named by Dr. Hance as found in the island.

A. lunulatum, Burn, (moon-shaped maiden-hair), is more often met with on the mainland. It is a very delicate fragile fern, so that specimens required for the herbarium must be shut up in a book or paper as soon as gathered.

A. caudatum, Hook., is common. Like the preceding, simply pinnate, but quite unlike in form and texture. The little pinnæ on each side of the stalk are rough, hairy, close together and deeply jagged, each jag bearing the sorus.

A. flabellulatum, Linn., is the most universal of the three. The divisions of the frond are in the form of a fan, and in twos, each pair nearly starting from a common centre. The venation is also fan-shaped.

The sori of Adiantum are too well known to need description. They are in patches along the margin.

The young frond is often tinged red or purple. This is also the case with *Blechnum orientale* (hard fern).

(*To be continued.*)

Hybernation of Cuckoo.—I cannot find any allusion to the hybernation of cuckoos, either in White's "Selborne," or in Buckland's Notes to the same, although White has so much to say about the hybernation of swallows. He mentions that when the thermometer is above 50°, bats fly abroad in any month of the year.—*M. E. Pope.*

THE ASCENT OF RORAIMA.

THE successful expedition of Mr. im Thurn to this remarkable mountain last December has excited a good deal of interest, from the difficulties attending the ascent, and the consequent ignorance which has prevailed concerning the nature of the summit. It was natural to expect, from the inaccessibility of the plateau, that when once it was reached, valuable information would be obtained as to the fauna and flora, if there were any, which had been for so long a time somewhat secluded from the surrounding country. In "Nature" for April 30th, extracts are given from a paper lately read at the Royal Geographical Society by Mr. J. H. Perkin, who accompanied Mr. im Thurn. From these it appears that on the 2nd of December the explorers reached a group of houses about four miles from Roraima, which is near the border of British Guiana, and three from Kukenam, these flat-topped mountains with dark precipitous cliffs, seeming like huge fortresses built on a mountain-top 7000 feet high, and with walls 1200 to 1800 feet in height. The features of these mountains, as seen from a little distance, seem to be extremely grand. Clouds of white mist accumulate in the gorge between, and, as the day advances, rise towards the summits, as was the case on Roraima soon after the top was reached, whereby a limit was put to the wanderings of the explorers; while after wet weather the water pours over the edge in splendid falls, some having a clear leap of 1500 feet down. The scantiness of the vegetation found on the exposed top of Roraima is attributed to the earth being thus washed away from the surface. On the sloping sides of the mountain, before reaching the cliffs, a large piece of swampy ground was met with, which produced exquisite orchids and ferns, and also the *Utricularia Humboldtii* and the Heliamphora or pitcher-plant with cup-shaped leaves full of water. Another Utricularia was re-discovered higher up, a small plant, two or three inches in height, growing on the branches of trees, and having a large deep crimson blossom. Higher still was a quantity of a species of heath with dark pink blossoms of six petals, about the size of a halfpenny. As the travellers reached the top of the ledge by which they made their way up, a number of fantastic weird-looking rocks were seen, but no trees. Small bushes from three to six feet high, a few orchids, two species of thick-leaved ferns, and a Utricularia, formed all the vegetation seen upon the summit. The rock was found by Mr. Perkin to be too hard to permit of his cutting it. The height attained was reckoned, by boiling the thermometer, to be 8600 feet. The ascent to the summit was made on December 18th. "Nature" publishes also illustrations of the scenery of Roraima taken by Mr. im Thurn, from whom a more detailed report is expected.

OBSERVATORY TROUGH.

DR. GILES'S arrangement for making a trough for watching animal and vegetable organisms, seems to me to supply a want for a simple apparatus of this kind; therefore I beg to intrude on your notice what I think will make the apparatus as useful, but so simple, that any one can make half a dozen in an hour or less without extraneous aid. I append a drawing; the clips that keep the glass cover on are simply a piece of brass wire bent to fit the slide (on a piece of iron). The arms of this can be bent to have sufficient power to hold the cover glass well in position.

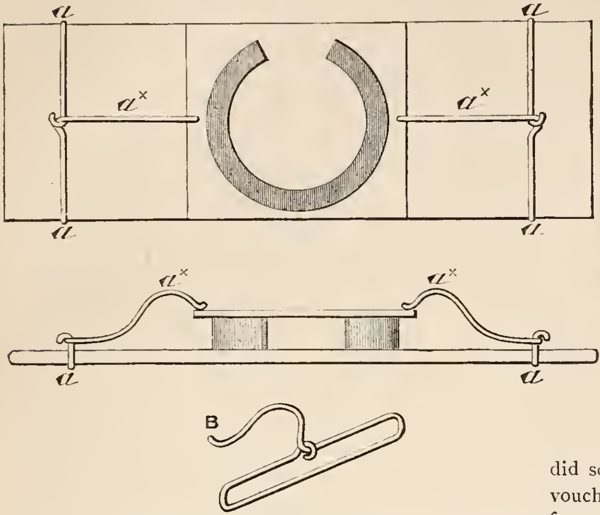


Fig. 94.—*a*, wire bent as shown at B, to slide on glass slip far enough for *a* to press on cover glass.

R. HAWKINS.

A BEAUTIFUL DIATOM.

AMONG the various genera of the Diatomaceæ, perhaps there is not one that is more beautiful, interesting and puzzling, than that of Stictodiscus. Puzzling, because of the curious way in which the numerous puncta, radiating more or less from centre to circumference, seem to be imbedded in the silex of the valves, so that it is most difficult to ascertain when their correct forms, or their relative position with regard to the surfaces of the valve is obtained.

The other day, in looking over a general balsam mount of the St. Marcia deposit, I came across a specimen of *Stictodiscus Californicus*, which may be considered the typical species of the genus. There were of course many on the slide, but this particular one was tilted up at an angle of some thirty degrees; it was a valve, not a frustule, but luckily the hoop or cingulum was still attached to it. In this position it was very easy to see the arrangement of the puncta on raised wedge-shaped radiating bands, and that the cingulum also was adorned with circles of puncta.

As my son was with me, who is a tolerable draughtsman, though no diatomist, I asked him to sit down and draw exactly what he saw under the microscope. He

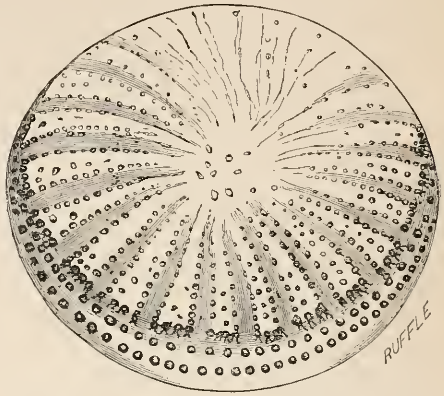


Fig. 95.—*Stictodiscus Californicus* (tilted position). × 600.

did so, without any prompting from me, but I can vouch for the accuracy of the sketch, which I send for publication in SCIENCE-GOSSIP, as it may be interesting to many of its readers.

FRED. H. LANG.

MY GARDEN PETS.

By E. H. ROBERTSON.

PART III.

MANY there are who firmly believe that bees are attracted by the colours of flowers, a belief in which I need scarcely say, I do not share, a life-long observation having led me to an exactly opposite conclusion. Indeed, as a set off to the few unreliable experiments occasionally recorded, proofs to the contrary may be multiplied indefinitely; and every observant bee-keeper well knows that bees gather some of their richest supplies from plants bearing inconspicuous blossoms, such as the gooseberry, raspberry, snowberry, mignonette, &c. Of all pollen-bearing plants, the almost invisible flowers of the box-tree are rifled with the greatest avidity, whilst many of the most brilliantly-coloured flowers either yield no honey, or secrete it in nectaries which the honey-bee (*Apis mellifica*) cannot reach.

My old-fashioned garden is, during a great part of the year, a blaze of colour, but comparatively few flowers yield my pets any sweets. It abounds in foxgloves, monk's-hoods, delphiniums, antirrhinums, &c.,

and from early morn till darkness gathers humble bees of every size, from the lumbering giants of their race down to the tiniest black pigmies, are busy extracting their honey, but beyond an occasional cursory visit by a roamer, the honey bee does not come near, nor ever attempts to rifle them of their sweets.

Why is this? Why does the humble bee fly direct to the flower, and, forcing his way in, clear out the nectary? and why does not the honey bee? His perception of odours is marvellous, and, unless he be colour blind, he must see the bright colours. The answer, as it appears to me, is simply that the humble bee *knows* that honey is to be found there, and that he *can* get it. My pet, too, knows that there is a rich store at hand, but does not waste his valuable time in trying to reach it, because he *knows* that he *cannot.* Whether this knowledge be, as some believe, a mere blind instinct, the possession of some faculty not cognizable by man, or an intelligent knowledge acquired by the exercise of its senses, it would be beyond the scope of the present paper fully to discuss. I may, however, say, in short, that I believe that there is absolutely no evidence to support the first; that in regard to the second, we need not credit the bee with the possession of some marvellous faculty surpassing our ordinary senses; and lastly, I consider that the healthy operation of the several senses possessed by the lower animals, in common with man, serves to convey to each creature those scraps of knowledge the sum of which we call experience, bees being no exception to the rule—nor can their experience be measured by our own; a single moment in their brief span of life, may mean infinitely more than an hour or day in ours. The fact is that the honey bee most affects those flowers which yield him the most abundant supply of honey and pollen, with the least trouble to obtain it, whether the colours be bright or otherwise. Sometimes indeed the flower *is* a brilliantly-coloured one, as in the case of the old-fashioned damask rose, in the pollen of which they often revel, although they will not even visit equally richly-coloured roses hard by, the pollen not being so come-at-able. What is sometimes termed the bees' preference for particular flowers over others has not often really anything to do with the creature's likes or dislikes: as a matter of fact being oftener than not his ability or inability to get at the coveted store. Even humble bees cannot reach the honey so abundantly secreted by the scarlet salvia without first cutting a hole in the lower part of the tube; when this has been done the honey bee frequently avails himself of his labours, and clears out such small particles as may still remain.

Should it be argued by the supporters of the "hereditary impulse" and "mysterious faculty" theories that the fact of the imago of insects depositing its eggs where its future offspring will find its natural food, although it no longer itself feeds upon it, proves that it is animated by a mere unreasoning instinct, I reply that this is pure assumption, and that it may, with far more show of reason, be assumed that, notwithstanding the creature's wonderful changes of form, its individuality has not been so entirely transformed that every atom of its larval nature has been annihilated, but rather that, it retains so much of it as enables it to select for the larva the kind of food upon which it once itself subsisted. Even in vertebrates, remarkable changes take place between infancy and the time of arriving at their perfect state, and their nature has not been changed when they have passed from the milk-imbibing to the flesh and fruit consuming stage. But I must draw rein.

I should be doing my favourites very scant justice if I brought to a close my somewhat desultory gossip, without paying a tribute to their intelligence; whether it be greater or less than that displayed by other members of the same great family, I am not now concerned to show. I may, however, say that, if contrivance, forethought, and calculation of cause and effect be any proof of intelligence, then my pets are worthy to be classed amongst the most intelligent of animals, that, indeed, "they act just as we act, and are as prompt and skilful in overcoming exceptional and artificial difficulties."

As single instances, out of innumerable that I might adduce, let me mention the following.

During the great heat which prevailed one recent summer day, I observed that the bees in a super lately placed over a hive, were in a state of great commotion and consternation, a closer inspection revealing to me that a large sheet of "foundation," which depended from the roof, and upon which they had commenced a superstructure of comb, had in part, by their weight and the heat, been torn from its attachment, and was on the point of utter collapse. Here was an impending catastrophe, to prevent which I was about to remove the sheet, when I discovered that my wise little friends were quite equal to the occasion, and soon I had the satisfaction of seeing a curtain, or chain of bees, formed, after their manner, from the roof of the super to the edge of the detached portion, to which they most tenaciously clung, thus by sheer strength effectually upholding the collapsing fabric. This would have availed but little had their labour not been supplemented by that of a body of wax workers, through whose energy I could almost trace the growth of a deposit of wax beneath their feet and jaws, and in the course of a few hours a thick column was formed from the edge of the circular hole in the super crown to the sheet upheld by the living curtain, and, not long after, an ever-lengthening sheet formed a continuous and unbroken comb from roof to floor. This most skilful labour fairly accomplished, the commotion gradually subsided, the curtain broke up, and all proceeded in the usual manner. Evidently conscious of its weakness at certain points, they here

strengthened it by additional wax ribs, and it ultimately became the thickest comb of the set.

About the same time a similar accident happened to a newly hived swarm, which had been furnished with combs of considerable size. These combs had, doubtless, not been securely attached, and the weight of the syrup, which I had supplied too liberally, brought down the largest comb of the lot upon the cross pieces of wood driven through the skep. Here, ready to topple over, however slightly the balance might be disturbed, it rested, and the sagacious little fellows, to avert the impending catastrophe, set to work with such goodwill that it was soon securely attached to the rods, although lying horizontally, thus preventing any further upset of their domestic arrangements. This preliminary operation finished, and not before, the bees ventured to remove the whole of the syrup, afterwards so skilfully adapting this and neighbouring combs to each other, that, in process of time, the aspect of the full hive differed but slightly from that of a hive wherein no such accident had happened. After witnessing the proceedings of the bees, I could not doubt that, conscious of the danger to the community, should the insecure comb have fallen to the floor, and conscious, also, that the crowding of a body of workers upon one end of the nicely balanced comb would probably precipitate the catastrophe it was their object to avert, they had avoided the ends of the waxen see-saw until the centre was made immovable.

In the case of another hive in the same row, a fallen comb actually reached the floor board; this being a serious obstacle to the efficient working of the hive, it was bit by bit removed, instead of being adapted. These random instances of bee intelligence will, I think, be sufficient to shew that they can contrive, adapt, and most successfully meet exceptional difficulties.

As an example of their sagacity, let me relate the following. During my absence from home, a large swarm of bees having been hived, the hive, with its floor board, was upon the ground, awaiting removal to its stand, when the attention of my wife was attracted by the remarkable proceedings of two bees, which were apparently directing their course towards the mouth of the hive, although at the distance of about a yard from it. Stooping to observe them more closely, she discovered to her surprise that the foremost was a queen, who was being urged forward by her companion, a worker, this latter displaying quite as much intelligence in driving the mother of the colony as would a drover driving an erratic cow. Now he would touch her gently with his antennæ, as if coaxing her to proceed, now hasten her lagging feet by a push up behind; now appear on the right, and anon on her left side, as she seemed inclined to deviate from a direct course. Soon he was joined by a second worker, who came out to meet them, and helped to escort his queen, and before the hive door was reached, she was surrounded by a crowd of delighted subjects, who led her in triumph to her new home.

Whether the first bee designedly set out in search of the missing queen, or whether he accidentally discovered her, his intelligence was, I think most persons will allow, equally remarkable, not, however, more so than I have witnessed in hundreds of instances. Young, and probably idle, bees are commonly driven out to their field work, for idlers are not tolerated in these industrious communities by the older bees, who follow them to the edge of the board, urging them forward by pushing their heads against their hinder parts. The driven one fairly off, the hive is re-entered and the process repeated.

(*To be continued.*)

SCIENCE-GOSSIP.

MR. A. G. CAMERON, of H. M. Geol. Survey, writing to the "Geological Magazine," says that fuller's earth is used in the fen districts of Cambridgeshire and Lincoln to purify the water, rendering it colourless and pleasant to the taste. It greatly weakens chalybeate water filtered through it, and will clarify muddy water, while springs rising from below the fuller's earth are said to be remarkably limpid and free from earthy impurities.

IN connection with the columnar structure of the basalt of the Giant's Causeway, a letter in "Science" describing hexagonal columnar structure in subaqueous clays is interesting. It was observed in the clays occurring in the nearly vertical side of a deep railway cutting near Menomonee, Wis., U.S. The columns, some of which fell out individually, varied in diameter from ten to fifteen or sixteen inches, were irregularly six-sided, and showed convex and concave surfaces where divided across their longer axes, parallel to the bedding planes. These cross-section surfaces exhibited also distinctly concentric, though somewhat interrupted, lines,—structure lines, not colour lines.

AT a recent meeting of the Royal Meteorological Society the report of a Committee appointed ten years ago on the decrease of water supply in springs, streams and rivers, and on the rise of flood level in cultivated regions was read. The drought period, of which till lately we had an example, is said to occur in cycles of ten years, and to be followed by a wet season. In accordance with this view, Mr. Baldwin Latham expected a wet season next autumn. The lowering of the water level in the chalk of the London basin was attributed, not to the condition of the general water supply, but to the constantly increasing pumping from new artesian wells.

In a paper contributed to the "Midland Naturalist," and published in separate form, Mr. E. Wilson, F.G.S., curator of the Bristol Museum, discusses the Lias Marlstone of Leicestershire as a source of iron. This rock has been already worked to some extent, and the author anticipates a great extension of the industry from the large stores of iron which must be contained in it and its proximity to the Notts-Derbyshire coal-field. The upper beds only are sufficiently rich in iron to pay for working. The paper is illustrated by a map of the Marlstone Rock of the district.

The "Youth Scientific and Literary Society" is now in its 2nd or 3rd Session. Its headquarters are at the Tolmers Square Institute, Drummond Street, N.W., where the meetings are held, and lectures, &c., delivered, one of the objects of the Society being to encourage the study of Natural History among young people. The President of the Society, which has representatives in a good many provincial towns, is Mr. J. W. Williams, B.A., B.Sc., and the Secretary, Mr. R. A. Neville-Lynn, from whom further information can be obtained.

Dr. P. Q. Keegan writes in opposition to the certainly rather pungent paragraph of Mr. Mattieu Williams, in the May number of Science-Gossip, on the question of throwing the classics overboard in modern education. Dr. Keegan thinks that an exclusively scientific training will not enable a man to dispense the elevating influences of science to the masses sympathetically or with the spirit of humanity. There are doubtless many who, for the same or other reasons, will to some extent agree with Dr. Keegan's views.

It seems that a great deal of lead is expended harmlessly in war. The "Popular Science News" for April publishes an illustration of a soldier surrounded with a multitude of bullets, grouped pretty closely over a circular space around him. It is intended to convey to the sense of sight the fact, that it takes on the average thirteen hundred bullets, even under the conditions of modern marksmanship shown in the Franco-Prussian war, to kill each soldier who falls in battle. The assertion, attributed to Marshal Saxe, that it took a soldier's weight of lead to kill him in battle, is said to have been shown to be not far from the truth at the battle of Solferino, where for every man killed, four thousand two hundred bullets were expended, which would weigh about two hundred and seventy-seven pounds of lead.

Mr. A. Melville Bell, who has been absent for some years from England, has been lecturing at Oxford on Visible Speech, or the Science of Universal Alphabetics, of which he is the inventor. Mr. Bell is the father of Mr. Graham Bell, the well-known inventor of the telephone.

Chlorine, hydrochloric acid, carbonic oxide, silicon fluoride, and arseniuretted hydrogen are now all known in the solid state.

Mr. F. O. Bower, Lecturer on Botany in the Science School, South Kensington, has been appointed Professor of Botany at the Glasgow University, succeeding Professor Bayley Balfour.

In the April number of "Science" may be found notes of the work done by the U.S. fish-commission steamer "Albatross," which last winter made a cruise in the region of the Gulf of Mexico. Near Havana large supplies of sea-lilies were hauled up on the 'Pentacrinus' ground. On the island of Cozumel, east of Yucatan, thirteen new species of birds, and two new sub-species were obtained.

It is said that a German publisher has brought out a book printed in dark blue ink on pale green paper, on the theory that neutral tints are good for the eyesight.

The programme issued for the annual conversazione of the Sheffield Naturalists' Club (April 17th), included the annual address by the President, Dr. Sorby, F.R.S., on Biological Researches, carried out on the yacht "Glimpse" in 1884, with lantern illustrations; ants' nests after Sir John Lubbock's method, from Mr. Henry Burns, the nests being illuminated and magnified, and containing the living ants; a collection of skeletons, zoological models, &c., from Messrs. Moore Bros. of Liverpool; entomological specimens from H. L. Earl, Esq., Oxon.; birds and other animal specimens, stuffed or living, from Mr. A. S. Hutchinson and others; the exhibition of microscopic objects by the owners of the instruments; a large number of mounted specimens of flowers from Mr. G. Hann, living wild flowers and wild ferns. Altogether to judge from the programme the conversazione must have been a success.

It appears now that not only coins, but bank notes are found to harbour bacteria and other microscopic organisms.

On the 20th March last the "Society of Amateur Geologists" met at 31, King William Street, E.C., when a paper was read by Professor Boulger, F.L.S., F.G.S., on "Organic Acids and their Geological Effects." Mr. Charles Lane also read a short paper on "Volcanic Rocks." On April 11th, the members of the society went to Finchley, under the direction of Professor Boulger, to examine the glacial deposits there. Both the meeting and excursion were thoroughly appreciated by the ladies and gentlemen who attended them.

It is announced that Dr. Frankland is about to resign the Professorship of Chemistry at the Normal School of Science and Royal School of Mines.

At the Royal Institution, Professor Langley, of the Alleghany University, Penn., recently delivered a lecture on "Sunlight and its Absorption by the Earth's Atmosphere." From a notice of it in the "English Mechanic" it appears that he ascended one of the peaks of the Alleghany Mountains in California, and measured the heating effects of the different parts of the spectrum at the bottom and at the top of the mountain. At the top he found the ultra-red end greatly elongated. The heating effects were presumably observed by means of the bolometre, an instrument which Professor Langley invented, finding that the thermopile was not sufficiently sensitive. In the bolometer, an exceedingly fine wire of platinum or iron (he made one wire from a leaf of iron $\frac{1}{13000}$th of an inch in thickness), has its temperature and hence its electrical conductivity changed in different parts of the spectrum, the result being shown on a very sensitive galvanometer. By means of a Rowland's grating, the effect of twenty or thirty prisms can be obtained without the squeezing together of the red rays which is the result of using glass prisms.

MICROSCOPY.

Cole's "Microscopical Studies."—Four slides, illustrative of this series, are to hand, viz. Jaws of *Epeira Diadema*; Batrachospermum; Lung, alveolar pneumonia, 3rd stage; and a transverse section of the organ of Bojanus from an Anodon.

Type Slide of Blood.—Mr. Ernest Hinton also sends a slide, showing in one mount the blood corpuscles of man, frog, bird, fish and snake, a very compact and instructive method of showing the differences of type in the several kinds of blood belonging to these different classes of vertebrate.

Dry Mounting.—In mounting objects by the dry process, a vapour condenses on the under side of the thin glass cover, which, on evaporating, leaves a series of small dots; thus entirely spoiling the appearance of the object under high powers. I may as well state that my method of mounting is taken from Martin's well-known manual, with the only difference of using a thin layer of gum before I apply the gold-size. I shall be much obliged if any of your numerous readers could give me any information on the subject. —*F. Cresswell Du Bois.*

Staining Nerve and Muscle.—I would refer E. B. L. for directions for staining the above, and the best modes of application, to read "Methods of Research as used in the Zoological Station of Naples," in vol. ii. of the "Postal Microscopical Journal," and also "How to Work the Microscope," by Dr. Beale, p. 299 (1868 ed.), &c., in which full details are given for demonstration of finest fibres, &c.—*V. A. Latham.*

Liverpool Microscopical Society.—The ordinary monthly meeting was held on Friday at the Royal Institution, the President, Mr. Chas. Botterill, F.R.M.S., in the chair, when there was a large attendance. Mr. I. C. Thompson referred to the loss sustained to microscopical science through the death of Mr. Charles Vance Smith, who, though paralysed for many years, had attained a high position amongst microscopists through his delineation of the microscopical structure of plants. Mr. A. Norman Tate, F.I.C., read the paper of the evening, on "The Microscopical Examination of Potable Water." After alluding to the impossibility of always determining by chemical means alone, whether a water is or is not fit for dietetic purposes, he proceeded to speak of the importance of microscopical investigation in relation to water supply, pointing out that it afforded better opportunity of determining the character of organic impurities, and that it might frequently assist in ascertaining the character of the mineral constituents. He described different modes of collecting and examining waters microscopically, and urged the importance of further investigation, so as to ascertain how far the organised matters present in water are capable of developing disease, and how such organisms may be destroyed. In conclusion he mentioned impurities found in natural ice, and also two methods of examination of rain and air. A discussion followed, and a conversazione was then held at which a number of interesting objects were exhibited.

Boro-glyceride for mounting Micro-objects.—During the past two years I have been experimenting on this substance, and with, at present, such good results, that it seems very worthy of extended trial. Boro-glyceride is an antiseptic manufactured under Professor Barff's Patent by the Kreochyle Company. It is non-poisonous and non-corrosive. Its two great uses are for preserving food and for antiseptic dressing for wounds. For mounting micro-objects, I use a saturated solution, made by dissolving the substance in warm water—using about one part to twelve of water—and allowing the surplus to crystallise out and settle. When it is known that this solution will preserve white of egg without coagulating the albumen, it will be seen to be very different in its chemical action from such powerful antiseptics as corrosive sublimate and carbolic acid. As far as my observation goes, boro-glyceride solution is excellent for vegetable tissues. It does not act on them in any way, grains of chlorophyll even remain unchanged. It does not destroy the aniline colours used for staining sections, although the delicate colours of flower petals appear to bleach in the solution. It answers for mounting insects whole and without pressure. Gold size or brown cement does for fixing the upper glass of the cell. The boro-glyceride, which is nearly a new substance, having proved useful and easy of

manipulation in my hands, it is desirable that competent mounters should try it and report results. To draw attention to it is my object in writing.—*A. P. Wire.*

Crystals for the Polariscope.—If Mr. J. W. Neville uses castor oil to mount crystals in, he will not be troubled any longer by the unpleasant results described by him.—*Charles F. W. T. Williams, B.A.*

Parasites of Birds, &c.—Mr. C. Collins has forwarded specimens of a new series of his "special" micro-slides; a series of parasites chiefly of birds. Those sent are the parasites of heron, gull, and penguin, each slide being furnished with a label giving the classification, from sub-kingdom down to species.

Royal Microscopical Society.—The Journal for April contains, besides the summary of current researches, the president's address on septic organisms, "The Lantern Microscope," by Mr. Lewis Wright; "On some unusual Forms of Lactic Ferment—*Bacterium lactis*," by Dr. R. L. Maddox; and a paper on a "Cata-dioptric Immersion Illuminator," by Mr. J. Ware Stephenson.

ZOOLOGY.

In the recent issue of the Proceedings of the Zoological Society of London is an interesting paper by Mr. H. Pryer, giving an account of a visit to the Birds'-nest Caves of British North Borneo, his object being to ascertain from what substance the edible nests, so much prized in China, are made. Large caves in Limestone rocks are inhabited both by bats and by the swifts, which build the nests in question, the nests being attached to the roof or walls of the caves. Mr. Pryer says that the material of which they are made may be found encrusting the rock in damp places, and resembling half-melted gum-tragacanth. The account of the departure of the bats and the return to roost of the swifts is worth quoting. "Soon I heard a rushing sound, and, peering over the edge of the circular opening leading into Simud Itam [or the Black Cavern], I saw columns of bats wheeling round the sides in regular order. Shortly after five o'clock, although the sun had not yet set, the columns began to rise above the edge, still in a circular flight; they then rose, wheeling round a high tree growing on the opposite side, and every few minutes a large flight would break off and, after rising high in the air, disappear in the distance; each flight contained many thousands. I counted nineteen flocks go off in this way, and they continued to go off in a continual stream until it was too dark for me to see them any longer. . . . At a quarter to six the swifts began to come in to Simud Putih [the White Cave]; a few had been flying in and out all day long, but now they began to pour in, at first in tens and then in hundreds, until the sound of their wings was like a strong gale of wind whistling through the rigging of a ship. They continued flying in until after midnight, as I could still see them flashing by over my head when I went to sleep. . . . Arising before daylight, I witnessed a reversal of the proceedings of the previous night, the swifts now going out of Simud Putih, and the bats going into Simud Itam. The latter literally 'rained' into their chasm for two hours after daylight. On looking up, the air seemed filled with small specks, which flashed down perpendicularly with great rapidity and disappeared in the darkness below." The swift has been determined to be *Collocalia fuciphaga*, the alga a species, probably new, of Glœoeapsa, and the bat, *Nyctinomus plicatus*. There is an abundant supply of guano in these caves.

Rana esculenta.—This frog, commonly considered to occur only on the continent, has been found in Norfolk. It appears that forty years ago or more, Mr. G. Berney turned some out in that county, and it is considered by Mr. G. A. Boulenger, F.Z.S., that the specimens captured are their descendants.

Succinea Pfeifferi, var. parvula.—I have recently found some Succineæ at Barnes, one of which I sent to Mrs. Fitzgerald, of Folkestone, and which she determined as belonging to the above form. I have recently taken on Barnes Common, with the Succinea, *Limax lævis* and *Hyalina fulva*, and a little way off, on a grassy bank, a specimen of *Cochlicopa lubrica*, which Messrs. Taylor and Roebuck have identified as var. *minima*, Siem.—*T. D. A. Cockerell.*

Varieties of Arion ater.—Mr. Elliot has sent me some specimens of the variety *bicolor*, which he finds in damp places near Stroud. It certainly is a very fine form, being rather related to the var. *albo-lateralis* of Roebuck. As a good deal of confusion seems to prevail concerning the varieties of *A. ater*, perhaps it may be well to give a brief description of the various forms, as I understand them. 1. Type form. Entirely black. 2. var. *marginata*. Black, with an orange or reddish foot-fringe. 3. var. *nigrescens*. Dark grey, with the sides usually rather lighter: var. *plumbea*, Roebuck; lead colour, seems to be very nearly allied to this if the two can well be separated. 4. var. *rufa*. Reddish or brownish. 5. var. *succinea*. Yellow or yellowish; var. *pallescens* of Roebuck is light yellow. Perhaps it would be better to call both these yellow varieties *succinea*. 6. var. *albida*. White. 7. var. *bicolor*. Back brown, sides primrose yellow, foot-fringe orange. The brown of the back is sharply defined from the yellow of the sides. 8. var. *albo-lateralis*. Back black, sides white, the two colours sharply defined as in *bicolor*, foot-fringe orange. This variety has been found in Carnarvonshire and in West Sussex. Mr. Elliot's variety, with the inter-

stices of the wrinkles light and the wrinkles darker, would seem to approach var. *nigrescens*, but it is probably distinct enough for a separate name. I fancy that the young of var. *succinea* are often alluded to in local lists as "*Arion flavus*."—*T. D. A. Cockerell.*

BOTANY.

Protoplasmic Continuity.—This subject has been extended by Mr. Thomas Hick, B.A., B.Sc., into the Fucaceæ, and in a paper contributed to the "Journal of Botany," and published in separate form, he gives an account of his researches. He thinks that they conclusively establish the fact of a continuity of protoplasm through the cell walls in Fucaceæ, though of a different type from that described in many of the Florideæ. His paper is accompanied by a plate, showing figures of *Ascophyllum nodosum.*

Twin Primroses.—When gathering primroses a few days ago, on a hedge-bank in North Wales, I found a "twin" primrose—two flowers growing on one calyx—one of the flowers having six petals, the other five. In another place, a double primrose was found, which had nine petals, six on the outside and three in the centre. These flowers were carefully kept as good specimens of uncommon primroses, more remarkable perhaps than those mentioned in Science-Gossip for January and March. Several very fine single primroses with six petals were found.—*M. E. Thomson.*

Orchids of the Rhone Valley.—In the last fortnight of April we have found the mountain slopes of the Rhone valley an admirable locality for orchidaceous plants. Evidently the character of the rock is congenial to the orchid nature, and nearly all the species here named were gathered from sloping pastures or woodlands on Lias Limestone. We must notice even the familiar *Orchis mascula* and *Orchis morio*, for beauty of the spike and strange variety in tint, and *Orchis maculata* for handsome spotted leaves. *Orchis latifolia* was abundant in the marshes, but not so fine as we have seen in the Isle of Wight. *Orchis ustulata* (dwarf brown wing) studded the meadows, interspersed with *Ophrys arachnites* (late spider), and *Aceras anthropophora* (green man). *Ophrys muscifera* was appearing here and there in woods with *Neottia nidus-avis* (bird's nest) and the Twayblade. *Habenaria bifolia* (butterfly) was in bud only, in the woods; *Habenaria viridis* (frog) being fully expanded. *Orchis militaris* we found fairly common in meadow lands. The previous year's spike of *Orchis hircina* (lizard) we noted, a prize seen for the first time; the prolonged though shrivelled life being quite sufficient to identify the plant; *Ophrys aranifera* (spider), was still in bud in the woods, apparently later in flowering in this locality than *O. arachnites.* In the less accessible parts of a mountain gorge *Cypripedium calceolus* (lady's slipper) was putting forth strong shoots to flower later in spring. A plant, however, from the same locality was out before May in a garden at Montreux. *Orchis sambricina* (the elder scented orchis) was scattered in profusion over the fields of the Salvan road, with *Orchis rubra* (=papilionacea) a splendid crimson flower.—*C. Parkinson, F.G.S.*

GEOLOGY, &c.

Geologists' Association.—At Easter a large party of the members of this Association visited Canterbury, Reculvers, and Richborough, under the direction of Mr. G. Dowker, F.C.S., and Mr. W. Whitaker, F.C.S., of the Geological Survey. Some of the members went down on Saturday and spent the day over the Tertiary country west of Canterbury. On Monday a visit was paid to Herne Bay and Reculvers, to examine the newer Tertiary beds of the cliff-section. The divisions between the Oldhaven, Woolwich and Thanet beds are less clearly marked here than near London, and hence differences of opinion exist as to the classification of the beds. These points were fully discussed on the spot. On Tuesday the party visited Pegwell Bay, where the lowest Thanet beds and their junction with the chalk were seen; then walked along the shore to Sandwich, crossing the Stour to Richborough on the way. Great changes in the coast-line have taken place, both here and at Reculvers since Roman times. These were explained by the directors. A pleasant surprise awaited the members in finding in the waiter of the Fleur-de-lis Hotel (Mr. T. B. Rosseter, F.R.M.S.) an excellent naturalist and original worker with the microscope. His instruments and preparations were placed at the disposal of the party during the evenings.

New Species of Mammals from Florida.—The Proceedings of the Academy of Natural Sciences of Philadelphia contain an account of two teeth from Florida, one of a supposed new species of Rhinoceros (*R. proterus*), and the other of a species of Hippotherium (Hipparion), the three-toed genus supposed to be the progenitor of our present horses, and first known in the European form of *H. gracile.* The latter tooth is an upper molar, and is said to indicate a small species little more than half the size of the domestic horse, or of *H. gracile.* To the new species thus indicated the name of *Hippotherium ingenuum* has been given.

Changes of Level in the South of England.—In the "Geological Magazine" for April, Mr. J. S. Gardner summarises these changes of level, during recent times, pointing out that there are indications of a rise having taken place at the Swale at Sheppey, the Reculvers, the coast off Richborough and off Hythe, the Dungeness Shingles, the Pevensey flats,

Kent's Hole, and to the east of the mouth of Beaulieu river; and of depression at Tilbury Docks, Selsea, Ryde, Brading harbour, Portsmouth, Bournemouth, Bourne valley, river Dart, Pentuan, Carnon, and Torbay; besides changes of some kind at Pagham Harbour, the Solent, the Isle of Wight and Poole.

NOTES AND QUERIES.

The WaterOusel in Northumberland.—This is perhaps one of the most common of the water-frequenting birds (wren and wagtail excepted). It is perhaps more common in Northumberland than in any other county in England, and is to be found in almost all the valleys of the small unfrequented streams of that county. There, in the summer, you may, if you sit by the banks of the river, catch sight of it diving into the water in search of insects. It has been said by a great authority, that the ousel has the power of walking on the bed of the river, but I am very much inclined to doubt that, though there is no doubt that its food consists of insects that cling to the bottom of the stones, as well as of small fish, and you would almost wonder at its power in getting to these insects. It is capable of staying a long space of time under the water, and it also swims well on the surface. It is most interesting to stand and watch this bird obtain its food. It will dive headlong into the water, rise up again after capturing its prey, and proceed to devour it, and if you go to the spot you will generally find it strewn with fragments of the shell, or cases of the water-insects. It builds its nests in the banks of the stream which it frequents, and prefers to be in the solitudes of the woods, rather than near the haunts of men, though I have known one case where one, or rather a pair, of these birds built their nest in close proximity to a large town. In winter especially, it seems to draw near to the towns and villages on the banks of the streams. It is then that its low sweet song may be heard to perfection. These birds are very early builders, a pair, to my knowledge, having commenced to build their nest early in the month of February, 1883. It was then beautiful mild weather, but early in the following month, before they had finished their building operations, a severe frost set in, followed by a heavy fall of snow. This did not at all hinder the process of building, but it seemed to be an incentive to make them work harder, for one morning, while the ground was covered with snow, I stood and watched them for about an hour, and I saw them fly into the tunnel (in the wall of which they were building their nest), every two or three minutes, with roots and leaves in their bills, and on March 15 it laid the first egg; this day was probably the coldest day we had that winter. But, soon after, I think when it had got its fourth egg, it was robbed by some idle boys. Strange to say, it shifted its residence to a new spot, not many yards from the old spot, and built a new nest, and succeeded in hatching its full complement of eggs, six in number. The eggs are of a beautiful white. The song of this bird is low and sweet, and, strange to say, when you hear it singing, you would think that you were listening to a chorus of birds instead of one. Its song may be heard at its best in winter.—*J. Bowman, Newcastle-on-Tyne, Northumberland.*

Ranunculus Ficaria.—Not only is *R. ficaria* usually classed as the "pile-wort," but it is equally commonly described as *Lesser celandine.* The following authors so name it: Sir J. D. Hooker, in the "Student's Flora of the British Islands"; Anne Pratt, Spencer Thompson, in "British Wild Flowers, where to find, and how to know them;" J. T. Burgess, in his little book on "Old English Wild Flowers." It is not wise to place any reliance on the popular or trivial name of a plant when seeking its genus, for such trivial name will often vary with locality. It would take a student a long time to find the evening primrose among the Primulaceæ.—*F. J. George.*

Golden Eagle's Eggs.—The fact of the eagle mentioned by A. F. being kept in captivity would not, I think, have any effect on the colour of the eggs. They are to be found from pure white to those of a rich dark brown, and I have a pair in my collection of the former colour taken in Scotland. It is, I think, more remarkable that it should lay at all, as, although it is said to be more easily domesticated than the white-tailed eagle, it is a species that does not readily lay in confinement.—*J. M. Campbell.*

Tree standing after a fall of many feet.—In the description in White's "Selborne" of a land-slip at Hawkley, mention is made of several oaks, which slipped thirty or forty feet, but still remained standing and in a state of vegetation. Several years ago, a similar occurrence took place in Hubbard's Valley, near Louth, when a beech (*Fagus sylvatica*) growing near the top of a steep bank, from the side of which much chalk had been excavated, slipped down, together with the earth at its roots, for a distance more than equal to its own height. This tree, which is still standing, produces every year an ordinary supply of foliage, and seems to have been but little affected by its fall.—*H. Wallis Kew, Louth.*

A correspondent sends from Kent a specimen of an abnormal bluebell (*Scilla nutans*) in which the bracts are greatly developed, attaining a length between two and three inches, or even more. The bracts are yellowish and green, instead of being blue, as in the normal flower, and their great length gives the raceme a tasselled appearance as in a sprouting ear of grass.

Chara and Nitella.—Can any one kindly inform me where chara and nitella can be found near Tonbridge?—*C. J. Bohnso.*

Purple Wood Sorrel.—Can any reader kindly tell me if this is a distinct species? I have found it several times in North Wales. In some places the flowers were a deep purple, in others a pinkish purple. In both plants, the under side of the leaves was very dark, those of the deep purple flowers being darkest.—*M. E. Thomson.*

The Colour of the Red Sea.—I shall be glad to add a few remarks to Dr. Stonham's in your March number, on the minute weed seen by him in the Red Sea. I have had many opportunities of observing it, and have found it in both Atlantic Oceans, both Pacific Oceans, and the Bay of Bengal, so it seems to be pretty largely distributed. I am of the opinion that it is often noted as volcanic dust when seen in calm weather floating on the surface, and also that it frequently escapes notice altogether. Sometimes I have seen it, and even when I have called attention to it floating in the sea, yet till I got some water in a bucket, other people could not distinguish it. In addition to the little bundles Dr. Stonham figures, little balls may frequently be seen very similar to the

little seeds one collects when walking through bushes, but which can all be pulled out with a needle into the separate fibres. The separate bundles are generally of a light brown colour, but when in great quantities it appears sometimes brown, and at other times almost black. In calm weather it collects principally on the surface, but when the sea is agitated, it then sinks to a small depth.—*D. Wilson Barker, jun., F.R.Met. Soc.; Chief Officer, s.s. "International."*

The Pied Fly-catcher.—On the 25th and 26th of April, I observed near here, a bird very rare in this part of the country, the pied flycatcher (*Muscicapa luctuosa*); a remarkable bird, owing to its strongly contrasted black and white plumage, and its great activity. I can find only two cases recorded of the appearance of this bird in Somerset or Gloucestershire, and both of these were many years ago. Morris, in his "British Birds" states that he had never seen this bird alive. I should be glad to learn whether this species has been observed elsewhere this spring.—*Alfred C. Pass.*

Holly Leaves.—The old holly-trees about here (Epping Forest) invariably show this tendency, the leaves of the upper part of the tree usually having only the terminal spine, with sometimes one or two additional spines. I have never seen a holly leaf in the forest without the terminal spine. It is a question whether the phenomenon is to be accounted for on the cattle theory, since those long upper branches of old trees which hang down within reach of the larger animals, frequently bear many leaves with only the one spine. Again, why should this one spine always remain? Is it known that cattle will eat holly leaves, if the upper ones are given to them? There seems to be an analogy between the upper leaves of an old holly and those of an old ivy, as in both the characteristic shape is lost. What is the explanation in the case of the ivy?—*F. W. Elliott.*

Flint Implements.—Are any flint implements found in the neighbourhood of Bagshot, and if so where is the best place to look for them?—*Charles Noble.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

We request that all exchanges may be signed with name (or initials) and full address at the end.

A. S. Mackie.—1. *Limnæa peregra*, but rather doubtful. 2. *Sphærium lacustre*. 3 and 4. We do not undertake to name foreign species. 5. *Cypræa Europæa*, if British. 6. The so-called "seal's egg" is the shell or "test" of a sea-urchin, an Echinoderm. A somewhat larger one with spines adhering was recently pointed out as a humming-bird's nest!

Herbert B. Alexander.—Your objects "are the so-called pseudo-podia of the moss *Aulacomnium androgynum*." The stalked heads "consist of little gemmæ which in this moss often replace the spores (capsules bearing spores are rarely found on it)."

S. J. H.—An answer next month if possible.

D. Bradley.—See "Engineering" for 1877 for articles on the Aneroid Barometer, which may answer your purpose. There should be numbers of the series also in some preceding year. Negretti and Zambra's "Treatise on Meteorological Instruments" is said not to be so thorough.

V. A. Latham.—Thanks for your suggestion. But a reviewer may not always know the price of a book reviewed. Ewart's book on the "Dissection of the Frog" is published at 1*s.* 6*d.* (London: Simpkin.) McAlpine's work is at present withdrawn from publication.

G. E. E. jun.—Write for specimens of "The Naturalist," 6*d.* Editors, Park Row, Leeds; "The Midland Naturalist," 6*d.*, (London, Bogue); "The Natural History Journal and School Reporter, 4*d.*, (William Sessions, York); (2) Lyell's "Student's Manual of Geology" gives a good many.

C. D. jun.—Your criticisms are too violent and "unparliamentary." Reconsider them and write again.

S. Chadwick.—Where and in what formation was the fossil spine found?

Thirsk.—Several of your mosses either had no fructification or it became spoiled.

Initials lost.—The lesser celandine is *Ranunculus ficaria*, a flower of the buttercup order. The celandine, or greater celandine, is *Chelidonium majus*, also a yellow flower, but belonging to the poppy order. The two plants are very unlike one another, though the name is similar.

EXCHANGES.

Good botanical, histological, crystals, polariscopic, diatoms, fish scales and miscellaneous, microscopic slides for others as good of bacilli, entozoa, algæ, desmids, zoophytes, rocks, fossil woods.—B Wells, Dalmain Road, Forest Hill.

Wanted, British and foreign Arionidæ and Limacidæ, also foreign Unioidæ and Physæ. Offered, shells, minerals, and specimens of *Cinomorium coccineum*.—Cajetan Platania Platania, Via S. Giuseppe, No. 14, Acireale, Sicily.

Lepidoptera.—Duplicates: Cardamine, Corydon, Io, Atalanta, *S. populi*, Ligustri, *Z. Trifolii*, Betularia, Piniaria, Rhomboidaria, Defoliaria, Rubiginata, Dubitata, Pyraliata, Perla, Lutosa (fair), Suffusa, Lota, Spadicea, Ferruginea (fair), Oxyacanthæ, Cerella. Desiderata numerous. Accepted offers answered within a week.—George Balding, Ruby Street, Wisbech.

Lang's "Butterflies of Europe," value £3 15*s.* Wanted, Lindsay's "Lichens," "Journal of Microscopy," vols. i., ii., and iii. Offers solicited. Martin J. Harding, Old Bank, Shrewsbury.

Wanted, an aquarium, with slate bottom and plate-glass front, back, and sides, size about 2 ft. × 10 in. × 10 in. Will give in exchange complete set of Cassell's "Technical Educator," unbound, or "Building News" for 1878 and 1880, bound in half-yearly volumes.—W. H. Pratt, 15 Gill Street, Nottingham.

Wanted, any or all London University Calendars, 1879–1884, inclusive. Offered, Darwin's "Cross and Self Fertilis. of Plants," Weale's "Integ. Diff. Calc.," "Sybil" (by Disraeli), Swainson's "Insects," or other mathl. or scient. works.—W. G. Woollcombe, The Close, Exeter.

Wanted, Science-Gossip, Jan. to May (or complete year), for 1870, also 1871, 1872, and 1873. Miscellaneous books in exchange.—W. Greener, 38 Black Lion Lane, Hammersmith, W.

Wanted, "Hogg on the Microscope;" Clarke's "Objects for the Microscope," and other microscopical books; also Science-Gossip complete for 1881, and "Common British Sea-Weeds," by L. Lane. Will give in exchange well-mounted micro slides.—W. S. Anderson, 7 Granby Street, Ilkeston.

Large number of British marine shells to exchange. Will collectors in all parts of the kingdom send lists of duplicates and receive mine?—J., 15 Warren Street, Tenby.

Wanted, a good microscope. Can offer in exchange a double-barrelled air-pump and accessories; electrical, chemical, and other apparatus; books; stamps; dried plants, &c., to full value.—Mr. Edwards, 34 Ling Street, Liverpool.

Wanted, "Journal of Naturalist during Voyage round the World," by the late Charles Darwin; and the first two vols. of the "Journal of the Postal Microscopical Society," unbound. Stand condenser for microscope, and also turntable.—L. Francis, 1 Elm Villa, Elm Grove, Rye Lane, Peckham, S.E.

Specimens of the new British plant, *Potentilla Norvegica* (see Hooker's "Student's Flora," last ed.), for new varieties of land and freshwater shells or antiquarian objects. Plant not in flower till June.—G. Roberts, Lofthouse, near Wakefield.

Wanted, vols. xi., xii., and xiii. of Maund's "Botanic Garden," or odd numbers.—Miss Higgins, 93 Wellington Street, Luton, Beds.

Good specimens of Canadian insects, reptiles, birds, and minerals for English specimens of the same; also a few Canadian land and freshwater shells for exchange. Correspondence solicited with parties desiring specimens of zoology, botany, and geology from Canada.—W. D. Shaw, Sect. Treas. Montreal Agassiz Association, 34 St. Peter Street, Montreal, Canada.

$\frac{1}{4}$ in., $\frac{1}{8}$ in., and $\frac{1}{12}$ in. objectives by Ross; exchange good binocular stand.—S., 20 Montpelier Road, N.W.

STUDENT'S monocular microscope, by Johnson, optician to University College, with mechanical stage, coarse and fine adjustments, sub-stage diaphragm, two eye-pieces A and D, 1 in. and ¼ in. object glasses, polariscope and selenite stage, condensor, live cage, stage forceps and tweezers.—M. I., 4 Lower Terrace, Hampstead. N.W.

WANTED, one of Shadbolt's turntables, or an equally good one; will exchange a genuine Mulready envelope, stamped, post-marked, and undeniably an original one.—F. Cresswell Du Bois, 15 West Cromwell Road, Kensington.

FINE micro photographs in exchange for good slides, &c. Microscopic objects photographed. — F. Guardia, Helston House, Rozel Road, Clapham, S.W.

WANTED, SCIENCE-GOSSIP from beginning of 1865 to end of 1884, either bound or in loose numbers; and also any other microscopical books or journals. State what is wanted in exchange for them.—Charles Von Eiff, jun., 347 Greenwich Street, New York City.

WANTED, pennies, halfpennies, and farthings of Edward I., Edward II., and Edward III. Flint flakes in exchange.—B Piffard, Hill House, Hemel Hempstead, Herts.

WILL send tube of living budding *Hydra viridis* on receipt of a good mounted object.—Thomas W. Lockwood, Lobley Street, Heckmondwike, Yorkshire.

WANTED, fresh specimens in fruit of the Musci, *Hypnum Atrichmum Grimmia*, *Pottia orthotrichum*, also *Marchantia polymorpha* and *Riccia glauca*. Well-mounted micro slides of interest offered in exchange.—R. A. Hawkins, The Cottage, Quarry Road, Hastings.

MICRO slides: will send in exchange for four good mounts the following:—fertile pinnule of hare's-foot fern (Davillia), ditto royal fern (Osmunda), tr. sect., ivy, ditto jessamine, both double-stained.—J. B. Bessell, Fremantle Square, Bristol.

WANTED, No. 11, vol. iii., of "Natural History Notes," published Nov. 1883, edited by F. J. Rowbotham. Offered in exchange, cretaceous fossils, land and freshwater shells, Lepidoptera.—A. Beales, 37 Kingsley Road, Maidstone.

WILL exchange SCIENCE-GOSSIP for 1884, the March number missing, for natural history specimens, especially stuffed birds or mammals.—George H. Brocklehurst, B.Sc., Roundhay, Leeds.

Cypræa lyna and *Cypræa helvola* from Zanzibar, and *Nassa reticulata* from Scotland; exchange for other shells not in collection.—Mrs. S., 21 London Road, Brentford, Middlesex.

OFFERED, Bourne's "Catechism of the Steam Engine" and "Handbook of the Steam Engine," Phillips' "Mineralogy," also "Knowledge," vol. i. unbound. Wanted, books on aquarium, especially Taylor's "Aquarium," or works by Gosse, or back volumes of SCIENCE-GOSSIP, &c.—G. A. Simmons, 102 Ladbroke Grove Road, London, W.

WANTED, skins and eggs of British birds in exchange for land and freshwater shells. Duplicates: *P. vivipara*, *B. Leachii*, *P. hypnorum*, *L. lævis*, *T. haliotidea*, *Z. nitidus*, *Z. glaber*, *P. pusillum*, &c. Desiderata: *S. ovale*, *U. margaritifer*, *Z. purus*, *H. fusca*, *B. perversa*, &c.—F. G. Fenn, 20 Woodstock Road, Bedford Park, W.

WANTED, local varieties of British shells; also mounted molluscan palates, and back numbers of scientific journals, especially the "Journal of Conchology." Shells in exchange, including *Paludina contecta*, *P. vivipara*, *Zonites glaber*, and *Helix lamellata*.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

WANTED, books by Hogg, Clarke, Martin, and others on the microscope; also Clark's "Seaweeds," and vol. vi. of the "Boys' Own Paper;" good exchange given in micro slides.—W. S. Anderson, 7 Granby Street, Ilkeston.

WANTED, SCIENCE-GOSSIP for 1879 and 1883, also any volumes earlier than 1876. Will give good micro slides in exchange.—Samuel M. Malcolmson, M.D., 55 Great Victoria Street, Belfast.

OFFERED, Gosse's "British Sea Anemones," Lyell's "Antiquity of Man," Pratt's "Wild Flowers" (large 4to.), "Testimony of the Rocks," and other good books. Wanted, French works on marine algæ.—T. H. Buftham, Connaught Road, Walthamstow.

WHAT offers in exchange for some large fossil fern slabs from coal pit, Heath, near Bristol? Tropical recent land shells preferred.—Miss F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

A 4-inch reflecting telescope in exchange for good microscopic objective or offers of scientific apparatus.—E. B. Fennessy, Pallas Green, Limerick.

LIVING specimens of *Hydra viridis*, now budding in tube, in exchange for mounting material, insects preserved in spirit wanted, such as:—Saw flies, horse flies, wood ant, fairy fly, or parasites of animals, or fish, &c., or else large spines of foreign Sea Urchin, for making sections.—W. H. Pratt, 15 Gill Street, Nottingham.

WANTED, British and foreign land and fresh-water shells, particularly some *Testacella maugei* in exchange for 2½ yards of very fine aviary wire-netting, a yard wide and ⅝ inch mesh, unused; also some of first numbers of "Knowledge" and "Amateur Work," Pirates of Penzance vocal score, and various other books, &c.—Wilfred Mark Webb, 31 Aynhoe Road, West Kensington Park, W.

SPONGE spicules: will send a well-mounted slide of spicules of the Cliona sponge (parasite on oyster shell), in exchange for any good slide, botanical or biological.—G. Swainson, 110 Park Road, Bolton.

WANTED, a $\frac{1}{15}$ or $\frac{1}{16}$ immersion objective. Will give in part exchange Cassell's "Popular" and "Technical Educator," quite new, well-bound in scarlet calf, or handsome musical box (ten tunes).—G S., 110 Park Road, Bolton.

GOOD shells, fossils, and works on osteology, &c., offered in exchange for odd parts of Lovell Reeve's "Conchologia Iconica" and of the Palæontological Society."—Miss Linter, Arragon Close, Twickenham.

BOTANICAL cabinet, 36 in. high, 18 in. wide, with a few specimens, for turntable and slides.—C. H. Goodman, 9 Dorlcote Road, Wandsworth Common.

WANTED, good book on mechanics. Offered, SCIENCE-GOSSIP, 1880, eighteen numbers of "Youth," forty numbers of "Boys' Newspaper," three numbers of "European Ferns."—Archibald W. Fry, Bridge House, Arundel.

MICRO slides for exchange. Wanted, books (science) or other slides. Lists free on application.—A. P. Wire, Seaton Villas, Birkbeck Road, Leytonstone.

A FEW slides of Antheridia and Pistillidia of mosses and hepatics, also ripe capsules of same, for other good mounts. Lists to—W. E. Green, 32 Belvoir Road, Bristol.

FRESH gathered crowfoot clustercups (*Œcidium ranunculacearum*) and dock clustercups (*Œcidium rubellum*), in exchange for nettle fungus (*Œcidium Urticæ*).—T. S. Morten, 3 Rosslyn Terraace, Hampstead, London, N.W.

WANTED Geikie's lectures at South Kensington on Geology, Dand's Geology, Mineralogy, or books on coins, for "Boy's Own Papers."—John Millar, Clarence House, Inverkeithing, Fifeshire.

OFFERED for exchange one hundred eggs with data of chough, sparrow-hawk, dipper, stonechat, grey wagtail, goldfinch, hooded crow, swift, ringed plover, redshank, heron, mute swan, puffin, guillemot, razor-bill, cormorant, gannet, herring-gull, kittiwake, storm-petrel and many others. Send list of duplicates and of desiderata.—Richard J. Ursher, Cappagh, Lismore, Ireland.

WANTED, fossil sharks' teeth from any formation, not more than three of any species, must be named and localised, in exchange for fossils from chalk, gault limestone, oolites, London clay, &c.—George E. East, jun., 10 Basinghall Street, London.

OFFERED, pair of tumbler pigeons in exchange for three or four well-mounted micro slides.—R. H. T., 28 Albert Road, Devonport.

BOOKS, ETC., RECEIVED.

"The Microscope in Botany," Dr. J. W. Behrens (transl.) (Boston: S. E. Cassino & Co.)—"Celestial Motions, a handy book of astronomy," W. T. Lynn, B.A. (Stanford).—"Birds I have kept," W. T. Greene, M.A. (L. Upcott Gill)—"Protoplasmic Continuity in the Fucaceæ," Thomas Hick, B.A., B.Sc. "Contributions to the Fossil Flora of Halifax," Thomas Hick and William Cash.—"A Correlation Theory of Colour Perception," Charles A. Oliver, M.D.—"Geology of the Comstock Lode," and Atlas (U. S. Geol. Survey).—"U. S. Geol. Survey, 3rd Report," 1881–2.—"Annual Reports of the Public Gardens and Plantations," Jamaica.—"Proceedings of the Academy of Natural Sciences of Philadelphia."—"The Lias Marlstone of Leicestershire as a source of Iron," by E. Wilson, F.G.S.—"Special Creation and Evolution," C. C. W. Naden.—"The Gold-fields of Victoria, Reports of the Mining Registrars."—"Report of the Kelvingrove Museum, &c.," Glasgow, for 1884. "American Naturalist."—"Science."—"American Monthly Microscopical Journal."—"The Naturalist."—"Ben Brierley's Journal."—"The Journal of Conchology."—"Feuille des Jeunes Naturalistes."—"Popular Science News."—"Canadian Science Monthly."—"The Medico-Legal Journal," New York. "Illustrated Science Monthly."—"Papers and Proceedings of the Royal Society of Tasmania," 1884.—"East of Scotland Union of Naturalists' Societies Reports," 1884.

COMMUNICATIONS RECEIVED FROM:—W. G.—C. C.—H. T.—P. S.—J. M.—H. C.—A. B.—H. W.—J. C. S.—G. H. B.—M. S.—W. H. P.—G. A. S.—F. W. L.—F. G. F.—C. F. W. F. W.—A. Y.—S. C. C.—W. S. A.—S. M. M.—T. H. B.—S. C.—F. M. H.—J. P.—E. B. F.—T. W.—A. D. W.—J. E. L.—C. D.—S. J. H.—G. E. E.—F. R. C.—C. H. G.—A. W. F.—W. E. C.—J. B. W.—J. W.—A. P. W.—M. E. T.—W. E. G.—T. S. M.—W. O.—W. G. W.—M. J. H.—E. C. N.—C. P. P.—J. G.—W. D. S.—J.—G. R.—D. W. B. jun.—F. W. E.—G. B.—W. H. P.—W. G.—W. S. A.—T. W. L.—C. W.—D. B.—B. T. & C.—A. A.—T. F.—C. S.—A. C.—G. F. H.—R. C.—R. A. N.—L.—E. D.—T. S.—A. B.—V. A. L.—T. W. D.—J. C. P.—F. R. C.—M. E. T.—A. E. T.—C. J. B.—W. W.—C. v. F. jr.—F. J.—B. P.—C. C.—A. S. M.—A. H. S.—T. F.—F. C. D. B.—H. W.—J. W. W.—H.—G. R.—C. F. W. F. W.—G. H. B.—C. R.—H. W. K.—S. C. C.—J. F.—C. F. F.—R. L. H—E. S. P.—R. J. U.—R. H. T.—A. K.—C. P.—W. M. W.—&c., &c.

E.T.D del ad nat Vincent Brooks Day & Son, Lith

T S SECTION OF SHELL OF BARNACLE.

× 30

GRAPHIC MICROSCOPY.

By E. T. DRAPER.

No. XIX.—Section of Shell of Barnacle (*Balanus sulcatus*).

THE cirripeds, or barnacles, in their adult condition have a curious dissimilarity of form. The Lepadidæ appear as pedunculated masses, and elegant groups of these "necked barnacles" are found on floating timber or wreckage. The fixed stem, or peduncle, is often several inches in length, thick in proportion, freely flexible, of peculiar tough texture, possessing voluntary movement, and surmounted or tipped with a conical articulated shell containing the animal, from the apex of which emerge the "cirri." Of the same family, although so unlike in appearance are the Balanidæ, popularly known as "acorn shells," sessile, the creature included in a compact although somewhat moveable calcareous domicile, firmly attached to the surface of constantly submerged rocks, and the bottoms of ships, enjoying, as the vessel drives through the seas, the luxury of a vagrant life, and with its singular and well-adapted casting net, collecting abundant food from the scums and shoals of microscopic organisms. The close relationship between the Lepadidæ, with their long flexible stems, and the Balanidæ in their shelly boxes, is detected in the perfect identity of the larval free swimming condition. At this point their similarity is manifest. When the perfection of this state is attained, the little creature seeks a point of attachment: the bottom of a vessel, floating substances, or the solid rock, and fixing itself by an outpouring of glutinous cement, in the one case prolonged into a stem-like flexible stalk, in the other fixed in a shelly pyramid.

Compared with the brilliant hues and elegant configuration of "shells" in all their interesting varieties, as appreciated by collectors, the appearance of a barnacle scraped from the bottom of a vessel has externally no great beauty, or attraction; but, like many apparently obscure objects, when subjected to microscopical examination, it reveals structural peculiarities and adaptation of very significant interest.

In the sessile group of the Cirripedia, of which *Balanus sulcatus* and *B. tintinnabulum* are the most prolific and common forms, unlike the compact and entire solidity of a shell as generally understood, it is composed of four or more thick external articulated conical plates, supported on a flat adhesive base, the apices running upwards. Within and enclosed in these are thinner and more moveable processes interlapping, and when reaching the summit so delicately fine as to become a mere slit of exquisite adjustment for the extrusion of the cirri, or curly filamentous appendages; these flash out, for the collection of food and purposes of aeration, and when as suddenly retracted the delicate edges of this sensitive operculum hermetically close the aperture, and the creature within. The growth of these laminated plates of shell is seen by perpendicular and transverse ridges, showing expansion in every direction. The base of fixture is a flat foundation of accumulated calcareous secretions, and in specimens taken from the hulls of ships, more or less incorporated with the paints and deadly oxides of metals used to discourage their accumulation. But balani generally succeed in eluding these ingenuities.

If a shell be broken into, near the base, inside, above the floor of attachment (the point of greatest resistance), a part may be seen corrugated, and having a columnar appearance; if a slightly oblique horizontal thin section be cut through this point, the apparently uninviting fragment reveals a structure of adaptability

rarely found in other calcareous organised deposits; a series of tubuli will be seen permeating through cancellated walls. This tubular development obviously affords strength against external pressures, and although mere conjecture is rarely reconcileable with scientific accuracy, it seems at least an instance of the application of the method of obtaining the greatest strength in the least compass, an idea supported by deeper investigation, as under a power of 70 diameters, the tubular streaks running through the "supports" to the edge of the inner surface, represented in the illustration by waved white lines are ound to be not solid or homogeneous, but so beautifully interlocked, that the whole may possibly possess a certain amount of "play" conducing to power of resistance and expansion; in a thin section, each piece, with its aperture, may with care be accurately separated.

Although space is somewhat limited, a word may be said of the "cirri" of the barnacle, the long slender incurved fringes of filaments, a living meshed net, a combination of barbed tentacles, a perfection of arrangement, and, according to the dictum of a great authority, composed of "about five hundred distinct articulations." The sensibility of these tendril-like organs must be most exalted, and thus, the barnacle traps and sifts its food, as the vessel sweeps through the waters.

The parent cirriped is a fixture, but its progeny are free swimming atoms, not unlike Cypris, one of the minute entomostracans of the ponds, except that in this early larval locomotive stage they keep together in shoals. Under magnification they are most comely and quaint objects. In one of Mr. Gossé's sea-side books is a plate of a pair of these creatures drawn and tinted with extreme elegance. No one who has seen a young cirriped, swirling about, with its compact form and apparently completed organisation, would conceive that it emanated from a parent so dissimilar in form and habits, or that it would eventually subdue its incessant activity and become an "acorn shell" fixed once for all, and wedged in by the pressure of surrounding neighbours.

Barnacles do not thrive in aquaria, they require the incessant rush and motion of water added to an abundance of microscopic forms of food. Small rock specimens will endure a few days' captivity, when the movements of the cirri may be watched, and attractive microscopical preparations afterwards made of the various parts.

Crouch End.

CHARA *v.* NITELLA.—Last year a chara (probably fœtida) was found within five miles of Tunbridge, in a pond by the roadside at Hadlow. If C. J. Bohnso sends his address to me, I would point out the locality.—*F. W. E. Shrivell, Hope Cottage, Hadlow, Tunbridge.*

NOTES ON LEPIDOPTEROUS PUPÆ.

By ALBERT H. WATERS, B.A. Cantab.

THE situations in which the pupæ of lepidoptera occur are many and varied. The common Pieridæ and Vanessidæ are very partial to the underside of the coping stones of walls, and some moths—as the vapourer (*Orgyia antiqua*)—have the same preference also.

The pupa of the swallow-tailed butterfly (*Papilio Machaon*) is attached to the sedge; that of the speckled wood (*Satyrus Ægeria*) to the lower parts of grass stems, the pupa of *Satyrus Semele* is buried in the earth, and that of *Satyrus Hyperanthus* is also contained in a little cavity on the surface of the ground. *Cœnonympha Pamphilus* too pupates close to the ground on the lowermost part of the grass stems, and *Thecla quercus* chooses similar situations. The pupa of *Thecla betulæ* is attached to the under side of blackthorn leaves, and those of the blue butterflies to the stems of the plants on which the larvæ feed. The reed tussock-moth (*Orgyia cœnosa*), spins its cocoon on the stems of *Arundo phragmites*, the drinker (*Odonestis potatoria*) attaches itself to the grass stems; the rare *Aspilates citraria* encloses its variegated chrysalis in a slight cocoon among the leaves of *Daucus Carota* and *Lotus corniculatus*. *Emmelesia albulata* pupates in the domicile it lived in throughout its caterpillar life, and which it formed by spinning together the leaves of *Rhinanthus crista-galli*. The prettily coloured eupithecia pupæ are mostly buried in the earth, and the green chrysalis of *Thera juniperata* is suspended to the twigs of the juniper bushes.

By digging at the foot of willow-trees in October and the four following months, we are pretty sure to turn up the pupæ of *Tæniocampa instabilis* in large numbers among the loose sods, and just beneath them we may possibly find the slightly-spun cocoon of *Ptilodontis palpina*, and deeper down in the ground the red brown glossy chrysalis of the eyed hawk-moth (*Smerinthus ocellatus*).

Among the fallen leaves at the foot of oak-trees we may come across the pupa of *Selenia illustraria*, and we may also find it at the foot of birch-trees; the cocoon in which it is enclosed is a very slight one. If we pull the loose sods to pieces when we commence digging at the foot of the oak-trees, we are pretty sure to find abundance of chrysalides of *Tæniocampa stabilis*, and may expect to meet with those of *Tæniocampa munda*. It is also at the foot of oak-trees that entomologists living in its localities may dig for the rare *Nyssia hispidaria* on the chance of turning it up. Among other pupæ to be dug for under oaks, mention may be made of *Notodonta trepida*, *N. chaonia*, and *N. dodonæa*. When the roots of the oak-trees are covered by an interlacing growth of brambles it is advisable to look out for the cocoon of *Cymatophora ridens* among the dried leaves and fragments of wood.

The pupæ of *Cymatophora fluctuosa* is enclosed in a slight cocoon among the fallen leaves at the foot of birch-trees. *Notodonta dictæoides* and *Notodonta dromedarius* are other species we may look out for in the same locality. They both attach their slightly made cocoons to the under side of leaves; of the two last named, dictæoides is somewhat the largest. *Notodonta Camelina* and *Amphydasis betularia* are also pupæ we may expect to turn up under birch-trees. Camelina also occurs at the foot of maple and oak, and betularia beneath lime and oak trees; I have also dug it up under willow.

Other pupæ the trowel may be expected to turn up in October are the following:—

Smerinthus Populi. Rough; muddy brown. Near poplar-trees, also sometimes in gardens under laurel bushes.

Smerinthus Tiliæ. Rough; dull red. At foot of lime and elm.

Sphinx Convolvuli. Smooth, with beak in front.

Sphinx Ligustri. Smooth dark brown, with curved beak-like proboscis in front. Under lilac-trees and privet hedges.

Deilephila Euphorbiæ.—Pale brown, delicately reticulated with black lines and dots. In loose sand on the sea coast.

D. Galii.—Brown. In sand on sea coast near Deal.

Biston hirtaria.—Blackish; somewhat dumpy. At roots of lime-trees; also pear and plum.

The following are among the non-subterranean species:

Arctia mendica.—Brown, smooth. In a dark-coloured cocoon among rubbish where dock abounds.

A. lubricipeda and *A. menthastri.*—Dark brown. In cocoons under rubbish.

A. urticæ.—Dark coloured. In a slight cocoon among water mint and other plants by the side of wet ditches.

Orgyia pudibunda.—In a cocoon among oak, lime, hazel, maple, and other trees.

Demas coryli.—In a slight web under moss at the foot of beech-trees.

Pœcilocampa Populi.—Brown. In a black, oval very compact cocoon, under bark, or ash, or poplar. Sometimes among dead leaves at the foot.

Eriogaster lacustris.—In a small oval compact cocoon under hawthorn.

Bombyx Rubi.—Smooth, dark brown; in a long loose cocoon with intermingled hairs. Among bramble and heath.

Saturnia carpini.—In a curious pear-shaped cocoon, open at one end, among heath, blackthorn, &c.

Ellopia fasciaria.—Among the dead needles at roots of Scotch fir. End of October.

Eurymene dolobraria.—Under moss on beech or oak.

Odontopera bidentata.—Under moss on oak and other trees. End of October.

Ephyra omicronaria.—Green. In a very slight cocoon in moss on maple-trees.

Platypteryx falcula.—In a slight web inside a doubled up birch leaf.

P. unguicula.—Brown, with greenish wing cases. Among beech leaves in a slight web.

Dicranura bicuspis.—In a compact gummy cocoon on the bark of alder-trees, generally in the crevices half-way down the tree on the north side.

D. furcula.—In a glutinous cocoon on the bark of sallow; generally very low down.

D. bifida.—In a very tough and strong cocoon on aspen bark. It gnaws a cavity in the bark, and fills the depression up with the cocoon, so that it is very difficult to find it.

Clostera curtula.—Dark brown, rounded at end. Between united aspen leaves.

Clostera reclusa.—In a slight cocoon uniting sallow leaves.

Gonophora derasa.—Conical, terminating in a horn-like point. Within united bramble leaves.

Thyatira batis.—Blackish; with stout thorax and sharp pointed extremity. In a slight cocoon among bramble leaves.

Cymatophora fluctuosa.—In a slight cocoon among birch leaves.

C. Or.—Red brown. Between united poplar leaves.

Cambridge.

ARTISTIC GEOLOGY.

Ffestiniog and its Neighbourhood.

By T. Mellard Reade, F.G.S., &c.

[*Continued from p.* 123.]

LLYN MORWYNION AND LLYNIAU GAMALT.

Several excursions and wanderings over the hills about these lakes will well repay the labour. The strata are very much broken up by faults in the immediate neighbourhood, which is well displayed on the survey map. At Llyniau Gamalt is to be seen a volcanic conglomerate, forming precipitous cliffs on the eastern side. These lakes from the boggy nature of the surrounding ground are not easily got at. The rock is full of large boulders of felstone; some of them in shape like kidney potatoes. Thin bedded ashes are interbedded with the conglomerate, and a true plane surface I noticed of these showed such regular jointing as to look like masonry. Following the outlet stream we came upon a very pretty series of falls which quite enchanted my boys. The remainder of the distance was mostly bog-trotting before we reached the main road.

Waterfalls.—These are very numerous and beautiful in the neighbourhood. The falls of the Cynfael within a half-mile walk are lovely in their variety. For a

mile the stream may be followed through a series of glens, gullies and gorges, overhung and festooned with trees. The geological interest as an example of denudation is also great. I sketched a view of Hugh Lloyd's pulpit, a pillar of rock left standing in the middle of the stream. Further up are some very large boulders wedged in the walls of the stream in quite a remarkable manner. These I have described in a paper to the Geological Society, so I will not repeat it here.

About three miles from Ffestiniog, on the road to Bala, we get fine views of the Rhaidr Cwm, a series of splendid falls on the same stream but quite different in character to those just described. It is a mountain torrent springing from rock to rock and cutting deep gorges in the hillside. It is above the level at which trees flourish.

A good walker may cross the moors at a point further on the road and get to Bettws-y-Coed by Penmachno. Nothing is more delightful than the air of these moors some thousand feet above sea level, and the gradual change in the long descent to the vale of Conway, from bare mountain sides to the luxuriant foliage of the vale is very agreeable. The falls of the Conway may be visited, and the return to Ffestiniog made by train to Blaenau.

Other Excursions.—I fear I have exhausted my reader's patience in these descriptions in which it is difficult to reproduce the feelings which take possession of the mind open to the influences and ever-changing moods of nature. It is impossible to walk anywhere about Ffestiniog without being gratified with the scenery. Many a walk did we take to Blaenau Ffestiniog, yet one may safely say that such is the variety of effect produced by the atmosphere and cloud, that the picture was never the same. The mountains at times seem to be pervaded with an impenetrable and mysterious gloom which excites the curiosity and we strive vainly to picture what is behind, while, at others, every detail lighted up is so distinct, and yet so tender, that one feels the depths of despair in trying to reproduce the effects on paper. I have said little about the vale. It is very beautiful but its beauty is not of that mysterious nature which constantly keeps the imagination on the stretch as the mountains do. At the same time some prefer the soothing effect of a combination of trees rocks and water making up such a landscape; so I leave it to them.

Excursions that will repay the geologist may be made down the valley of Dolwyddelan, past the Castle, and across the mountains to Capel Curig, and thence back to Bettws-y-Coed. We pass the foot of the grand cone of Moel Siabod, a landmark among the mountains. Again, a trip to Harlech may be made, noting the remarkable anticlinal hills on the left (at the bottom of map LXXV., north-east), the surface contours of which are formed by the curved bedding planes which, wrapping over the hills, terminate successively to the southward in well-defined scarps. This is perhaps as curious and instructive an example of denudation as may be seen. At Harlech Castle we note how remarkably the Cambrian grits, of which the walls are built, have stood the weather, while the sandstone dressings of the openings have crumbled away. The architecture of the front to the interior quadrangle is massive and grand. Beyond Harlech we saw quarries in which the grit and interlaminations of slate may be studied; and still further on, a great bank of drift, lying on the mountain side, and skirted by the Cambrian railway, may be investigated; that is, if the explorer is not afraid of thorns and torn clothes.

A trip down the narrow gauge railway to Port Madoc, and a visit to Borth, is both pleasant and instructive. At the latter place geology may be combined with sea bathing. It is a very pretty little bay, hewn by the sea out of the Lingula beds. Nor must we omit a visit to the grand volcanic mass of the Arenigs, or fail to notice the enormous blocks and boulders in the railway cutting near Arenig station here, 1200 feet above the sea level. It were impossible to do justice to all the details of interest, geologic and artistic, within reach of the sojourner at Ffestiniog; in the space at my command I can do little more than outline them. Nor is the district devoid of interest to the antiquary. A good pair of legs and lungs, guided by scientific ardour, will do wonders. I have avoided all references to fossil collections. My object was, firstly, to gain health; secondly, to find a pleasing occupation for the mind. Without the latter Ffestiniog would be voted slow; with it, and the great inducement presented for rambles and long walks, I found it health-giving, exhilarating, and ennobling to the mind. What is beauty? has been a question debated by artists, philosophers, and poets. We know by *feeling* what it means, but the metaphysical analysis which attempts an explanation of the conditions of mind under which it is perceived is usually unsatisfactory in its answers. Of this, however, I am sure: given the constitutional temperament which rejoices in the harmonies of nature, the wider the knowledge the keener will be the perception of natural beauty.

But I must not forget my geological readers. In describing my trip to the Bwlch Drws Ardudwy, I was so taken up with the outward show and semblance of things that I quite forgot to explain that we were passing over what may be considered the central dome of the Welsh system, forming originally the highest part of the mountain system of North Wales, but now stripped bare of its former covering of Silurian rocks both upper and lower, with its much altered Cambrian rocks deeply eaten into by denuding agencies, yet still presenting mountains rising 2400 feet above the sea level. These great mountains, the Rhinogs, Diphwys, &c., are entirely carved out of the Cambrian strata from base to summit after the

removal of many thousands of feet of Silurian rocks. What a vista of time does not this present to the imagination! But to read about these denudations is insufficient; it is necessary to walk about, map in hand, to thoroughly realise their meaning. It is then that geology becomes a living fact, a sublime thought before which historical ideas of time and action are mere fugitive shadows. Being brought face to face with such facts cannot fail to profoundly influence our ideas of the relation in which we stand to Nature. There are many aspects in which these relations may be viewed, they have been dwelt upon by the great minds of all ages; but not the least awe-inspiring, if bewildering, is the panorama of creation which geology only within the last fifty years has unfolded, and vaguely in broad outlines pictured to the human eye.

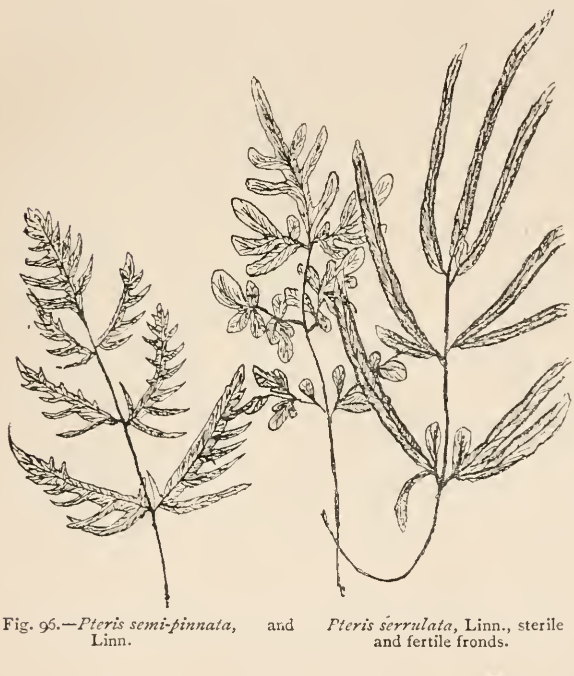


Fig. 96.—*Pteris semi-pinnata,* Linn. and *Pteris serrulata,* Linn., sterile and fertile fronds.

Fig. 97.—*Asplenium* (Dipl.) *Japonicum,* Thunb.

SOME FERNS OF HONG KONG.

By Mrs. E. L. O'Malley.

[*Continued from p.* 134.]

Gen. VII. Pteris, Linn.

(*Brake.*)

ALL the species of this large genus by no means resemble *Pteris aquilina*, or eagle fern, so called in some counties from the supposed likeness, as every boy knows, to a spread eagle, in the vessels of the stalk cut traversely; but in all, the covering of the sori is marginal and continuous. It runs along the entire length of the leaf, and consists of the margin specially transformed. In some there is a thin inner membrane turned up to meet the proper indusium. This forms a connecting link with Lindsæa.

P. aquilina, Linn., or common brake, is the only species with the double indusium found in the island. Surely no description of the fern is necessary for English people, living as they do, and bearing with them to foreign lands the recollection of the homes of their childhood? Brake is found all over the hills and in every part of the island.

P. nemoralis, Willd. (or *quadriaurita*, Retz.), is still more abundant, especially in the town of Victoria. This species is twice or bi-pinnate, and easily distinguished, as the lowest pinnæ on each side of the rachis are in twos, and hang down, a habit common to the order, and no doubt suggesting the name from the likeness to a bird's wing (pteron—a wing).

P. longifolia, Linn., or long-leaved pteris, is a large fern, fond of heat and dry dusty places, simply pinnate, except the two lowest pinnæ, but all the pinnæ narrow straggling and long. An untidy-looking fern, and one which might at first sight be mistaken for *Blechnum orientale*, but the sori placed at the edge, instead of down the centre of the leaf-segment, at once mark a different genus. In pteris, the extreme point of the segment is always destitute of sori, a peculiarity we do not observe in ferns of other genera. Two more species are common, both smaller and more delicate in texture.

P. semi-pinnata, Linn., or half-pinnate pteris, is one of the commonest plants in the island, and very

easily known by the half-formed frond, of which the top of each segment or division appears to have been cut off.

P. serrulata, Linn., is common in gardens. The sterile and fertile leaves are different—those of the former being serrated.

Gen. VIII. Cheilanthes, Sw.

In Cheilanthes we find a very lovely little fern, almost as delicate as and not altogether unlike *Lindsæa heterophylla*. Its name—*C. tenuifolia*, Sw., thin-leaved cheilanthes, well describes its nature. The stalk is slender, black and hair-like. The tiny, curled, much-cut segments of the leaf have sori running all round and just inside the edge. The frond seldom exceeds 6 in. in height; it is ovate, triangular in outline, bright green, and grows in banks along with Lindsæa and maidenhair. In some countries it is known as lip-fern, from the indusium covering the seed, as the lip covers the teeth, but it must be remembered the covering is single, not double. The very tiny, almost round pinnules—the under side rough with downy hairs, and often nearly covered with the confluent sori, which has the appearance of being curled inwards, enable the botanist easily to identify the species.

Gen. IX. Asplenium, Linn.

(*Spleenworts.*)

The disposition of the sori, running along the veins, constitutes in this genus the principal specific distinction.

Of this very large genus we cannot say that more than two species are really common in Hong-Kong. *Asplenium Schkuhrii* (Mett.) (Ihbg.) reminds us at once of the pretty maiden-hair spleenwort of English heaths and hedges, only the black stalk is missing. It is usually found from 8 to 12 inches high, but sometimes attains to a greater size. The frond is simply pinnate, tapering to a point, and pinnules serrated. Like most of the spleenworts it is graceful and delicate-looking. *Asplenium dilatatum*, Hk., must strike many as an old friend. It grows on the Pok-fillum road and elsewhere, but in England is one of the commonest objects on the hillside. The frond is twice or thrice-pinnate, bright green and feathery in appearance. We have heard it called "parsley-fern," from its likeness to the leaf of wild parsley (*Anthriscus sylvestris*). *A. lanceum*, Th., is uncommon. The frond is undivided (entire), about 6 in. long and ½ to 1 in. broad, with a slightly irregular edge and sori in streaks along the upper or both sides of the veins.

(*To be continued.*)

Vol. XIX. of the new edition of the "Encyclopædia Britannica" (pey–pro) has been published. It contains illustrated articles on Polyzoa and Protozoa by Prof. E. Ray Lankester.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

In the Bulletin of the American Geographical Society is an account of the mosquitoes in Alaska, which to those who have not had some experience of these pests in Arctic regions, appears incredible. Shooting is described as impossible, because the clouds formed by them were so dense as to prevent aiming. Native dogs are sometimes killed by them, and Lieut. Schwatka heard accounts from reliable persons which, coupled with his own experience, he fully believes, of the great grizzly bear falling a victim. The bear having invaded the swamps where the mosquitoes breed and congregate, stands up on his hind legs and fights them with his fore paws, but as they are neither huggable nor scratchable, he fails, is blinded, and finally starved in consequence.

The popular notion that these abominable little wretches are chiefly resident in tropical and sub-tropical countries is quite a mistake. The home of their mightiest legions is within and about the Arctic circle. This is evident even in the course of an ordinary coasting trip round the North Cape. At every station where a halt is made, a living cloud invades the ship, and its passengers suffer accordingly, especially at the wrists, where the blood-suckers hide under the shirt cuff, and operate secretly. On proceeding out again to sea, they are blown away. On the occasion of my last trip, two of my fellow passengers landed on Magerö to ascend the North Cape cliffs. We picked them up again on our return. They were in sorry plight. One of them, a sturdy Uhlan officer, who had ridden through France during the war without mishap, was unhorsed by the mosquitoes, and crippled by the fall. Both horse and rider were so irritated that both were lost to rational control. "I did svallo mosquitoes; I did breeve mosquitoes; I did spit zem out of my mouf," were the terms of his description.

I find that as the limits of the swallow's summer visit is reached the plague commences, and when those limits are passed, its maximum is attained. I believe that our comparative immunity in England is due to the abundance of our swallows and martins, which even the most brutal of cockney sportsmen respects, or fails to hit, and whose nests are wisely protected by common consent of all our rustics. The swallow is as loveable as the sparrow is detestable.

The healing power of living whale blubber is shown by a fact narrated to the Royal Society of Tasmania, viz., that in a whale captured in Behring's Straits in June 1883, a harpoon was found imbedded in blubber, having "Henty. L. 1838" branded upon it. In 1838 a whaling establishment belonging to an old Colonial family named Henty existed at Portland Bay, Victoria. As Behring's Straits are a long way from Victoria, an interesting question is suggested. Did

the Hentys sail nearly half-way round the globe to harpoon the whale, or did the whale travel into the other hemisphere to avoid further communications with the Hentys?

What is the range of migration of whales? Do they cross the equator? I have seen several in latitudes of considerable variation; those in lower latitudes going straight ahead as *bona fide* travellers, and at a speed that would soon cover a few thousand miles.

If scientific mariners and ocean passengers would record the sighting of whales, with date, latitude, longitude, and direction of the monster's course and probable speed, I think we might obtain some interesting information. I have little doubt that on the largely frequented ocean tracks, certain whales might thus be identified, as seen in different parts of their journey from different ships. As there is always a lower ice-cold current in all the North and South ocean highways, the cetacean tourist may at any time take a refreshing dive when the surface is oppressively warm.

Among the papers published in the "Bulletin of the Philosophical Society of Washington, for 1884," is one by Mr. Washington Matthews on "Natural Naturalists." The author finds that the aboriginal Indians are students of Natural History, quite outside of the animals and plants they require for use. He says: "I never failed to get from an Indian a good and satisfactory name for any species of mammal, bird, or reptile inhabiting his country; and I have found their knowledge of plants equally comprehensive. The Indians are, in this respect, as a class, incomparably superior to the average white man." The editor of "The Journal of Science" quotes the above, and adds: "This evidence shows how much our powers of observation have been stunted by the exclusive, or, at least mainly, literary character of our educational systems. From childhood our attention is fixed upon words, written or spoken, and except, among specialists, inobservance has followed."

It appears that my own remarks in the May number of SCIENCE-GOSSIP, on the still surviving exaltation of the Latin classics in modern education, have brought forth a remonstrance from Dr. P. Q. Keegan (see page 138 of June number). He misunderstands me. I by no means advocate the exclusion of literature, but the contrary; and would give precedence far above all to English literature, which is practically excluded from the present curriculum of grammar schools, and miserably neglected in our universities. If there really is any basis for the popular scholastic notion that ancient literature is especially elevating, why not be consistent, and commence with Greek? There is originality, subtlety, ideality and philosophy in the Greek classics, those of the Romans are at best but clumsy imitations; their poetry and philosophy standing as much below those of the Greeks as their sculpture and architecture, and similarly second-hand. The fact is that our persistent cramming of Latin is a monkish inheritance; the reasons alleged for its continuance are mere afterthought apologies that were never imagined by its founders, who were clerics, and ignorant of everything but the language of the church.

One of the most puzzling manifestations of "instinct" is that presented by the overland migration of fishes. That they should leave ponds which are gradually drying up is easily understood, as the water necessarily becomes more saline or harder as the evaporation proceeds, but that they should steer directly towards larger ponds, or towards rivers, as we are told they do, is very astonishing. My own suspicion is that they do not; that they simply wriggle blindly through the wet grass and either perish or survive as it happens; that the wonderful sense of direction exists only in the imagination of those who describe the migration. In a country that slopes towards a river it is of course probable that the majority will proceed in the direction of least resistance *i.e.* downwards, and thus eventually reach the river.

I have observed that pond fishes, such as eels, tench, and carp, have remarkable powers of remaining alive out of water; eels for several days; carp and tench remain alive in damp grass above twenty-four hours; in cool weather double this time. "Nature," June 4th, page 111, says: "The eels of the ponds in the woods of Vincennes leave them every spring in large numbers, making their way to the Seine or the Marne, several kilometres distant. They take advantage of rainy weather, when the herbage is wet, and their instinct guides them directly to their destination."

Careful observation of the proceedings of these eels would be very interesting. Do they ever travel up a slope, or transversely to it? If they only descend from higher ground downward to the river, there is no more occasion to invoke any mystery of instinct to explain such a course than to attribute the seaward flows of the river itself to the directive instinct of the water.

The origin of the iron pyrites which exists in all our coal, and in some seams so abundantly as to render them nearly worthless (the "brassy" coal of Flintshire for example) has long remained an unsolved enigma. M. Dieulefait, in a communication to the Academy of Sciences, has shown that the ash of plants constituting the nearest surviving representatives of those of the carboniferous epoch, contain much more sulphur than ordinary recent plants. This is especially the case with the Equisetaceæ. I should add that besides the gold-like crystals of iron pyrites there are varying proportions of sulphate of calcium in coal. If this large proportion of sulphur was common to all the plants from which the coal was formed, M. Dieulefait's solution of the problem is satisfactory.

Mr. Galloway has done good service in his persevering study of the agency of coal dust in producing colliery explosions.

He has completely refuted the old-established notion that they are simply due to the combustion of the hydro-carbon gases to which the miner gives the name of "fire-damp." Mr. Galloway has demonstrated clearly that fine coal dust stirred into ordinary air forms a mixture having fearful explosive energy. The only question which he leaves debateable, is whether a destructive colliery explosion may be due to this alone, or whether an initial explosion of fire damp always occurs.

That such initial explosion, by stirring up the coal dust otherwise lying dormant, and at the same time igniting it, may be in many cases operative is not to be doubted; but the very practical and very serious question, of whether a pit free from outbursts of carburetted hydrogen may nevertheless be liable to explosions if dry and carelessly worked, still remained open. Mr. Galloway contends that the dust alone is dangerous; others have denied this, notably so MM. Mallard and Le Chatelier in their report to the French Commission du Grisou. Since this a Prussian Fire Damp Commission has been appointed, and has investigated the subject very thoroughly, their results confirming those of Mr. Galloway.

The subject is of great and growing importance. We are rapidly exhausting our old coal seams, and continually going deeper and deeper to supply the voracious demands of our blast furnaces, gas works, wasteful fire-places, &c., and as we get deeper, we come upon dry workings, where, unless special precautions are taken, every shot stirs up a cloud that may contain particles fine enough to produce a local explosion, the which stirs up another cloud to explode in like manner, and so on to fearful results, even in a pit where naked candles may be carried with safety if the air is not violently agitated. The practical bearing of this upon the kind of precaution demanded is self-evident. The source of danger being so different from that of fire damp, the precautions must be modified accordingly.

The commercial results of sewage farming are usually very discouraging. This however has not been the case at Forfar, where, according to the published accounts, a field of 38 acres, which cost £3,600, or £94 per acre purchase money, has yielded a profit, the total cost of working being £220 15*s.* including horse labour, manual labour, seed and repairs, and auctioneer's commission. The receipts were £509 12*s.* 6*d.* leaving a balance of £288 17*s.* 6*d.* or 8 per cent. on the capital outlay. This however does not include any management expenses, but supposing a capitalist to have undertaken it, and managed his own business and thereby saved the £24 5*s.* 2*d.* charged for auctioneer's commission, he would have obtained a return of nearly 9 per cent. with very little trouble. We appear to be within measurable distance of returning to the soil nearly all we take from it, thereby restoring our rivers to their pristine purity and vastly increasing our food supplies. If the still continuous downfall of rentals urges the landlords to give to this subject the degree of practical attention which their own interests demand, we may have reason to exclaim with the banished duke, that "sweet are the uses of adversity."

TEETH OF FLIES.

By W. H. Harris.

No. VI.

(*STOMOXYS CALCITRANS.*)

THE genus from which the present illustration is taken, forms a small one of the order Diptera, embracing, according to Walker, three species only, viz., *Stomoxys calcitrans*, *S. irritans*, and *S. stimulans*. Towards the close of summer, and during the autumn,

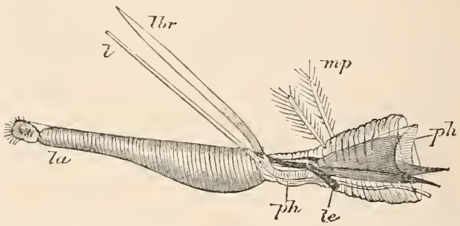


Fig. 98.—Mouth of *Stomoxys calcitrans* × 14 diam. *ph, ph,* pharynx; *lbr,* labrum; *l,* lingua; *la,* labium; *mp,* maxillary palpi; *le,* levers or fulcra of labrum.

S. calcitrans enters our houses, and, by its persistent and aggravating attacks on mankind, does much to destroy the equilibrium of the best of tempers. It is commonly known as the stable fly, but is not at all disinclined to pay attention to oxen, &c. So similar is it in general outward appearance to the ordinary house-fly, that, unless special attention is directed to the mouth organs, it may easily be mistaken for *Musca domestica*, but while the latter is comparatively an inoffensive creature, the former is an unmitigated nuisance; in fact, the only redeeming point about it is of a purely negative character. Possibly by stimulating the attacked party to take some exercise to rid the pest, it may do some good, but the benefit thus derived is more than counterbalanced, if a quiet after-dinner nap has been contemplated. The proboscis is cylindrical, with an enlargement near its point of attachment to the head. Unlike the Muscidæ, it is incapable of being withdrawn, but always projects from the head downward and slightly forward. It is chitinous, black, hard, and beautifully polished. Under the microscope, about three-fourths of the circumference is seen to be thickly set with very delicate transverse striæ, and

a fourth part at first-sight apparently quite devoid of any marking. By careful manipulation with a couple of needles this may be withdrawn, and will be found to consist of two distinct parts, an outer one, or sheath, through which the enclosed needle-like organ freely moves. When the proboscis is in its natural condition, these parts are seen to enter, and are capable of being moved within the cylinder, which extends for a short distance towards the end of the proboscis. A reference to figure 99 will give some idea of the two parts referred to, the main portion of the proboscis being omitted.

a is the sheath (Labrum) carrying the needle, *b* (Lingua) in its concavity, while the convex side being outward completes the cylindrical outline of the proboscis. The aperture at the extremity of the sheath agrees in size, and comes into close proximity to the mouth, or rather that part of it in which the organs of dentition are situated, and to which these notes are chiefly intended to refer; but the whole organ is so full of interest I have been led to make these remarks as bearing in some measure upon the subject, and necessary to some extent if we desire to comprehend the action of the mouth.

The free ends of these organs are very thin and delicate, and quite inadequate as a means of inflicting a puncture. Their use undoubtedly is to convey the liquid aliment to the œsophagus by constantly sliding the parts within each other, on the same principle as that employed in some instances for lubricating machinery by means of the needle lubricator, which may be familiar to many.

Fig. 99.—Suctorial apparatus of *S. calcitrans* enlarged. *a*, sheath (labrum); *b*, needle (lingua); *c*, apertures, use unknown.

Fig. 100.—Diagram of Teeth of *Stomoxys calcitrans* × 330 diams.

The enlarged portion of the proboscis is liberally provided with muscles, and from these tendons extend down to the mouth; they are very numerous, sufficiently so to supply individual movement to the teeth and other organs therein contained.

In order to display these organs a different mode of procedure is necessary to that employed in Muscidæ. The end of the proboscis must be cut off, and the point of a very fine knife inserted in the opening and laid open, similar to what is done to display the gizzard of a beetle. The operation is well calculated to test the patience of the operator,

and many failures will occur before a satisfactory view will be obtained, unless singularly fortunate or proficient.

The teeth are of two distinct types, and associated with them are other organs to which reference will be made. The primary set are stout and admirably formed for puncturing the skin of the victim selected. They are five in number (dealing as heretofore with one half of the mouth), each of these carries one rather small point or denticle, and, in addition, they are very finely serrated, three on one side only, the two central ones on both sides, but it requires a high power to see this distinctly. In this respect the figure is slightly exaggerated for clearness' sake. Immediately behind these teeth, and situated near to their apex, is a set of short curved appendages, a pair being allotted to each tooth. They are quite opaque and uniform in thickness throughout. Their use appears to be for maintaining hold while the other instruments do the cutting and wounding. Next follow a set of sabre or lancet-shaped teeth, very fine at the points, and by the lightness of colour, delicate in structure, but, nevertheless formidable in number for the size of the mouth. These are the organs for making an incision. When this has been accomplished, the small hooks are inserted, and the primary set soon completes the work. The margin of the mouth is very thickly set with strong hairs, each springing from a well-defined base, apparently capable of movement. The integument is quite opaque, but near the margin assumes a tesselated appearance, the original cellular structure being preserved, the cells are partly filled with pigment, thus leaving the margins well defined.

It will be observed there are no pseudo-tracheæ present as in the Muscidæ, and as these play an important part in the collection and conveyance of the food, their absence is fully provided for in the organ I have attempted to describe.

If these creatures are plagues when alive, to the microscopist, they are in death doubly so, at least with regard to their mouth organs. Small, hard, and very brittle it is extremely difficult to obtain a fairly representative mount, but patience and perseverance will accomplish much. In this case it has done a little to explain the wonderful contrivance employed to replenish the larder of this little creature.

Slugs Biting.—It is stated by Rimmer that Testacella will "bite savagely." I have never succeeded in making it do so, but the other day on handling a large black specimen of *Arion ater* the animal at once seized one of the folds between the fingers of the hand on which it was placed. The rasping action could be distinctly felt, and after he had been allowed to operate for about a minute the skin was seen to be abraded.—*W. Gain, Tuxford.*

CHAPTERS ON FOSSIL SHARKS AND RAYS.

By Arthur Smith Woodward.

V.

Spinacidæ.

The Spiny Dog-fishes and their allies form a large family whose palæontological history appears to begin with the deposition of the Lias. So far as is known, *Palæospinax*, from the Lower Lias of Lyme Regis, is the fore-runner of the race, and the earliest example of a living genus is *Spinax primævus*, from the Cretaceous rocks of Mount Lebanon.

Exceedingly perfect specimens of *Palæospinax* have been discovered in the well-known Liassic fish-beds of Lyme Regis, and by a study of these remains Sir Philip Egerton has been able to elucidate the structure of the genus ;* space, however, prevents us from entering far into the anatomical details, and it is only possible to glance at one or two of the most prominent features. The ordinary length of the shark being not much more than eighteen inches, the teeth are very minute, and the use of a lens is necessary to reveal their characteristics. They are remarkably Hybodont in shape, but a great difference exists between those of the upper and lower jaws, and there is also considerable variation even in the dentition of the same jaw ; fig. 101 represents a tooth from the anterior part of the upper jaw, and fig. 102 a lower tooth of corresponding position. The dorsal fin-spines (fig. 105, A, B) are likewise of small size, and their external surface is smooth, exhibiting no ornament except a few scattered tubercles and indistinct lines of growth at the base of the exposed portion : it is interesting to notice that the anterior spine (A) is smaller, stouter, and more recurved than the posterior (B)—the reverse of what occurs in *Hybodus* and *Acrodus.* The slender body is covered with fine shagreen, and the fins appear to have possessed strong supporting rays of cartilage; and, although the second dorsal fin almost corresponds in position with that of *Cestracion*, there are indications of the anal being merged with the caudal (according to Egerton), and this is a special character of the family now under consideration.

The history of *Drepanephorus* affords a typical example of the slow but steady progress of palæontological knowledge. In 1822, some spines and vertebræ from the Chalk of Lewes were referred by Dr. Mantell to the Teleostean "File-fish," *Balistes*. In 1838, Prof. Agassiz showed that the fossils in question really belonged to a shark, and considered them to indicate an extinct species of the living genus, *Spinax*, which he designated *S. major.* Twelve years later, Sir Philip Egerton described

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* Mem. Geol. Surv., Dec. XIII., 1872, Pl. VII. ; see also "Quart. Journ. Geol. Soc.," vol. xxix., 1873, p. 420; and "Ann. and Mag. Nat. Hist.," [5], vol. vii., 1881, pp. 429-432.

some scattered teeth from the Chalk, under the name of *Cestracion canaliculatus*, because they seemed to differ but little from those of the recent *Cestracion*, except in their smaller size and the possession of a minute channel passing obliquely through the root of each. Three years after this, in 1853, the same ichthyologist announced the discovery of a specimen proving the teeth and spines to belong to one fish; and in 1872 Sir Philip, also, published detailed descriptions of all the more important specimens then available, and proposed the generic name by which this Selachian is now known.* Fig. 106, A, B, are drawings (half nat. size) of the first and second dorsal fin-spines, which are only marked by lines of growth and do not appear to have been very deeply implanted in the soft parts; and figs. 103, 104 represent an anterior and posterior tooth, the former quite prehensile, and the latter adapted for crushing, as is the case in the front and back teeth of *Cestracion*. *D. canaliculatus* is the only species of the genus at present recognised, and its remains occur chiefly in the Chalk, although other English Cretaceous deposits have yielded a few fragments.

RHINIDÆ.

Our object in this series of articles being to dwell chiefly upon those Selachian fossils that most commonly come under the notice of English collectors, and to summarise the results of the latest researches relating to such, a passing notice will suffice for the small, but interesting family of "Angel-fishes" and "Monk-fishes." None of their remains are known to occur in British strata, and the Lithographic Stone (U. Oolite) of Bavaria and France appears to be the only Continental deposit yielding examples of importance. These have been referred to the living *Rhina* (= *Squatina*) and the doubtfully distinct genus *Thaumas:* though the gill-openings are lateral, the general form of the body is much like that of the Rays, and there are no dorsal spines.

PLEURACANTHIDÆ (XENACANTHIDÆ).

This is an extinct family, of which much yet remains to be learned. It comprises the various forms that have been described at different times under the generic names of *Pleuracanthus*, *Diplodus*, *Orthacanthus*, *Xenacanthus*. and *Triodus*, and which it is now almost universally agreed to unite under the first (the earliest) of these terms. *Triodus* is undoubtedly identical with the previously-described *Xenacanthus*, and there is no doubt, likewise, that this is the same as *Pleuracanthus*. The chief disputed point is, whether *Pleuracanthus* and *Orthacanthus* really differ generically, or merely specifically, and the most recent contribution* to the subject, by Mr. J. W. Davis, of Halifax, seems to show that the latter is most probably the case.

* Mem. Geol. Surv., Dec. XIII.

The ordinary fossil remains of this family met with in Britain, are confined to Carboniferous strata, and present themselves in the form of detached spines (called *Pleuracanthus* and *Orthacanthus*) and teeth (known as *Diplodus*), but the Continental specimens, to which we shall shortly refer, are much more complete and occur chiefly in the Lower Permian. The spines are long, usually straight, and tapering to a point, with a smooth or finely striated surface, upon some part of which are arranged two longitudinal rows of denticles; they much resemble the spines of recent Rays in external shape, but differ from those of such as *Trygon* and *Myliobatis* in not being solid, but possessing a hollow cavity which opens at the base. Fig. 107 represents a typical example of the *Pleuracanthus* spine, half the natural size, and the diagrammatic transverse sections, figs. 108, 109, show the difference between this and the form originally termed *Orthacanthus*; the latter, it will be observed, is much more cylindrical than the former, and the rows of denticles are placed close together along the back, instead of far apart along the sides, but in the paper already mentioned, numerous intermediate forms are described, which demonstrate that these are only the two extremes of a nearly continuous series.

The little bodies known as *Diplodus* (fig. 110) consist of a thick bony base, upon which are fixed two comparatively large diverging denticles, with a smaller denticle and a little flat-topped or rounded boss rising between. They occur not unfrequently at many Coal Measure localities, and considerable numbers are sometimes met with in association. Agassiz originally described them as teeth, and this seems to be the view now generally accepted, but some palæontologists have expressed the opinion that they are simply dermal tubercles analogous to the prickles of the "Thornback" and other recent Rays.†

The Permian specimens of *Pleuracanthus* (*Xenacanthus*) found in Germany elucidate many important details in the anatomy of the interesting Selachians whose fragmentary remains have just been noticed. Some examples, in fact, exhibit nearly all the hard parts of the fish in their proper relative positions. The body is slightly flattened, and the general shape recalls that of *Rhina;* there are numerous teeth, of the *Diplodus* type,‡ in the jaws, and the large

* Quart. Journ. Geol. Soc. London, vol. xxxvi. (1880), pp. 331–336. References to previous literature are here given.

† "Ann. and Mag. Nat. Hist." [4] vol. i., 1868, p. 371.

‡ We may here note that this type of tooth is not exclusively confined to *Pleuracanthus*, having been found in association with at least one other spine in the Lower Carboniferous, (T. Stock, "Nature," vol. xxvii. 1882, p. 22). Further, recent numbers of the American Scientific Journals contain notices of a new Shark, named *Chlamydoselachus* from the Japanese seas, of which the dentition is exceedingly similar; in fact, Professor Cope has ventured to refer the latter to the Palæozoic genus, but the figures show the fish to be very different in form and indicate the absence of a spine.

straight spine is imbedded in the muscular tissues at the back of the head. The structure of the paired fins, so far as can be ascertained, is singular, and there is a long dorsal fin behind the spine, but the caudal is imperfectly known. The skin appears to have been almost destitute of shagreen, and hence traces of the internal skeleton are well shown; there is evidence of the notochord being persistent, but neural and hæmal arches, with interspinous elements for the support of the dorsal fin, are distinctly visible.

known by Sir Richard Owen in his "Odontography," in 1840. The crown of the tooth is somewhat petal-shaped—a peculiarity suggesting its name—and is fixed upon a remarkably long root; the cutting edge is slightly denticulated, and a number of transverse folds of enamel usually appear at the base. It is essentially a laniary tooth, and no part can have been used for grinding or crushing; but the mode of arrangement of the dentition in the mouth, and the number of its components, can only be inferred from what is known of allied forms, no very perfect


Fig. 101.—Upper anterior tooth of *Palæospinax priscus.*


Fig. 102.—Lower anterior tooth of *Palæospinax priscus.*


Fig. 103.—Anterior tooth of *Drepanephorus canaliculatus.*


Fig. 104.—Posterior tooth of *Drepanephorus canaliculatus.*

Fig. 105.—Dorsal spines of *Palæospinax priscus.*

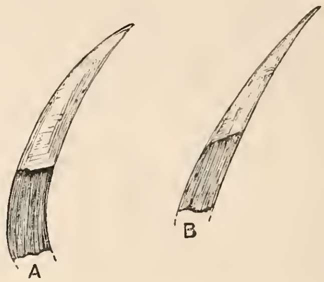

Fig. 106.—Dorsal spines of *Drepanephorus canaliculatus.*


Fig. 107.—Spine of *Pleuracanthus lævissimus* (½ nat. size).


Fig. 108.—Trans sect. of spine of *Orthacanthus.*


Fig. 109.—Trans. sect. of spine of *Pleuracanthus lævissimus.*


Fig. 110.—Tooth named *Diplodus gibbosus.*


Fig. 111.—Tooth of *Petalodus acuminatus.*

Petalodontidæ.

Like the group just considered, the Petalodonts constitute an extinct family, ranging only through a limited space of geological time; numerous genera, or so-called genera, are known to occur in strata of Lower Carboniferous to Upper Permian age, but none appear to have been discovered in deposits of later date. These fishes were evidently destitute of spines, and so are represented as fossils merely by teeth, shagreen, and occasional fragments of cartilage; but we are fortunate in possessing important information regarding the arrangement of the dentition in at least two of the forms, and these particulars afford valuable aid towards determining the natural affinities of the group.

The type-genus is *Petalodus* (fig. 111), first made examples of jaws of *Petalodus* itself having hitherto been met with. It occurs abundantly in the Lower Carboniferous, and specimens have even been recorded from the Coal Measures, but, as will presently be shown, the identification of the latter must be regarded as doubtful.

(*To be continued.*)

On June 9th a statue of Mr. Darwin, executed by Mr. Boehm, R.A., was unveiled in the British Museum of Natural History, South Kensington, in presence of the Prince of Wales and a large assembly. Professor Huxley, as Chairman of the Memorial Committee, made over the statue to the Prince of Wales, who represented the Trustees of the British Museum.

PARASITICAL FLOWERING PLANTS.

By A. D. Webster.

THIS curious and interesting class of plants has but few British representatives, and these, with perhaps one exception, by no means ornamental, which will, to a great extent, account for the very meagre information we at present possess regarding the various species of which the family is composed.

Fig. 111.—*Orobanche rapum.* Broom-rape.

Among British parasitical plants are the following genera: the dodder (Cuscuta); broom-rape (Orobanche); toothwort (Lathræa); and mistletoe (*Viscum album*); these again being subdivided into about a dozen species, the following being a short description of each, with original notes jotted down as opportunities offered. These parasites may be divided into two kinds, viz.: those that attach themselves to the roots of different plants, as the broom-rape and toothwort, hence called root-parasites, and those that live on the stem or branches as the mistletoe and dodder.

The genus Orobanche comprises some half-a-dozen species, most of which are difficult to recognise, and have given a more than ordinary amount of trouble in classification. They are fleshy herbs, with tuberous roots, and never truly green, but generally of a brown or russet colour. They are also destitute of leaves, but covered instead with small, brown or reddish scales.

These plants present the remarkable peculiarity that each species is generally confined to or lives on the same species of plants, thus the *Orobanche major* feeds upon furze and broom; *O. rubra* upon thyme; *O. ramosa* on hemp and lucerne; *O. minor* on red clover, turf, &c.; *O. elatior* on various species of composite, as centaury and milfoil; and *O. cærulea* on *Achillea millefolium.*

The greater broom-rape (*O. major*) is, as its name denotes, our largest native species. Here I have found this plant in considerable quantity, but, strange to say, always parasitic on furze and never on broom as the popular name would lead one to suppose. In most botanical works it is also stated to be found in greatest quantity on broom, less so on furze.

This cannot be attributed to the want or absence of broom here, for in several cases where I have found the broom-rape growing in abundance, there were also in close proximity numberless plants of the broom, so that had a preference been given, as is generally believed, there is no doubt it would have been found on the latter plant, especially under such favourable circumstances. I have also frequently noticed that this broom-rape seems to prefer living on such plants as grow in a warm, dry, usually sandy soil and sheltered situation, as on the more exposed parts of the ground, although furze may be growing in quantity, the broom-rape gradually disappears, whereas on the southern and consequently warmer side it is found in abundance. The root is tuberous and composed of a number of lanceolate, fleshy scales, somewhat similar in appearance to those of the lily, and so closely packed together at the centre that when cut across with a sharp knife the root appears quite solid. The scales on the outer portion of the root are, however, less firmly packed, and the points slightly protruding. When bursting through the ground the shoot in size, shape, and appearance very closely resembles that of our garden asparagus, even the peculiar purplish hue, so characteristic of that plant when in a young state, is not wanting in the orobanche. The reproduction of this plant, which is both marvellous and interesting, is affected either by seed or increase of the root. In the latter case the new root or tuber, as in our common Orchis, is produced alongside that of the one supporting the present plant, and inwards

towards the main stem of the gorse. The root is, however, capable of producing more than one new tuber at the same time or during the same season, as I have frequently found after careful examinations of old plants that there were two and in some cases three new tubers formed, and ready for advancing into active growth in spring. They are usually attached to the roots of the gorse at a depth of from four to six inches, and never, that I have seen, above ground level.

The propagation by seed is a very slow process, these usually requiring three and in not a few cases four years to produce flowering plants. The plants never appear above ground until of a flowering size, which will readily account for the absence of young specimens—a fact which has frequently been noted and commented upon by accurate observers. As all the specimens examined were, as above stated, growing on the gorse roots at a depth of from four to six inches, I have often been puzzled to satisfactorily account for how the seeds penetrate to such a depth. The only probable explanation, and one that will also account for the greater abundance of the plant in gravelly porous ground, is that the seeds, being very minute, are readily washed downwards by the heavy rains through the loose sandy soil in which the plant delights to grow.

That this plant is parasitical, and not epiphytal, as supposed by some, I have repeatedly proved beyond a doubt, for on carefully digging up the root it will be found impossible to sever it from that of the furze, and even when cut across at point of attachment both seem so perfectly united as to appear like one. I also think it is an error to figure this plant as it is in most floras with rootlets at the point of parasitical attachment, as these, although I have gone to a great amount of trouble in grubbing up plants to find if such really was the case, I never could detect. Certainly there are rootlets, as those of other plants seem to have a particular affinity for working their way between the loose outer scales of the tuber of this plant. The root of the furze also sends out tiny rootlets which may readily be mistaken for those of the orobanche.

That part of the furze root where the attachment takes place is much enlarged, but outward from that point it dies off, no doubt from the circulation of the sap being averted by the parasitic growth. The plant flowers in May and June, the period being however, greatly extended in some specimens.

From observations made for a number of years I have every reason to believe that in a dry, warm season this plant attains to greater perfection, and remains undestroyed for a much longer period than during dull, damp weather. The largest specimen I have found measured thirty-eight inches in length, had a stem one and a quarter inches in diameter, and bore ninety-nine flowers.

This gigantic specimen I have carefully preserved as a memento of the plant. The average size in this district when growing under favourable circumstances is, however, from two to two-and-a-half feet in height.

The lesser broom-rape (*O. minor*), though smaller in all its parts, very nearly approaches in general structure the former species, indeed it is questionable if these two species are specifically distinct, as the different plants on which the orobanche grows seem to alter the nature of the so-called species in a remarkable degree. As the name indicates, this plant is usually of smaller growth and more slender than *O. major*, and with more or less of a blue tinge in the flower, but this is by no means constant, as forms with pale yellow and deep blue flowers are not uncommon. This species seems to be by no means particular as to the plant on which it grows, having been found somewhat plentiful on our common ivy, clover, the Eryngium, &c., and varying much according to the plant, as well as situation, in which it is found—this having no doubt given rise to the several varieties into which the plant has been divided ; but the differences between these varieties, or rather forms, are so minute and inconstant as to be deemed unworthy of separate remarks. It occurs sparingly in this country, and is more generally found on the turf than any other plant.

Two other species very nearly approaching the latter are the clover-scented and red broom-rapes (*O. caryophyllacea* and *O. rubra*), the former parasitic on galiums and the latter on thyme. It is generally believed, indeed has been recorded on the highest botanical authority, that *O. rubra* is not parasitic, and that the plant is exclusively confined to basaltic rocks, such as those of the north of Ireland and east coast of Scotland. That neither of these statements can, however, be accepted as wholly correct, the following interesting and valuable information, kindly furnished by Mr. Lindsay, curator of the Royal Botanic Gardens, Edinburgh, only too plainly shows. Mr. Lindsay says, "In reply to your note regarding *Orobanche rubra* being parasitic, I have to say that it is so, and think there can be but little doubt that the other species are parasitic also. In the rock garden here, *O. rubra* has become thoroughly established, self-sown plants have come up in different directions, but always on some species of thymus, oftenest on *T. serpyllum*, never on any other kind of plant." I have no doubt that this plant is more abundant in Britain than is generally supposed, but the inconspicuous appearance, and out-of-the-way places in which it is usually found, as well as general resemblance to *O. major*, have all much to do in accounting for the supposed rarity of *O. rubra*.

The branched broom-rape (*O. ramosa*) is a rare British species, being almost confined to a few of the southern English counties. This and the blue broom-rape (*O. cærulea*), the former in particular, are the only members of the family having branched or

divided stems, though this peculiarity is not constant in all the plants.

The branched broom-rape is a very distinct species, being usually of a pale yellow or straw colour, and seldom exceeding six or eight inches in height. The branches spring almost immediately from the root, and in an upright position, and are, at the point of juncture, slightly enlarged. When fresh, or in a growing state, the stem is almost cylindrical, but becomes angular when old, is slightly pubescent, of a dirty yellow colour, and furnished with but very few scales. It is usually found on hemp, and for this reason is perhaps less plentiful than if hemp crops were more generally cultivated. This is an annual species, but is readily propagated by sowing the seeds along with those of the hemp, to the root of which it will soon become attached.

The purple or blue broom-rape (*O. cærulea*) is a small growing plant, rarely reaching a foot in height, and readily distinguished from any other member of the family by the colour of the flowers, which is of all shades, from pale violet to a deep purplish blue. It is occasionally found branched, though much less seldom than the former species.

In the Channel Islands this plant is pretty abundant, more so than in England, where it has only been found in Hampshire and Norfolk, and there always parasitic on *Achillea millefolium*.

(*To be continued.*)

HOLIDAY RAMBLES THROUGH WIGTONSHIRE.

By G. Claridge Druce, F.L.S.

[*Continued from p.* 132.]

THE third day was by rail to Castle Kennedy, the magnificent demesne of the Earl of Stair, whose judicious taste has made the park one of the most beautiful in Britain, and the collection of conifers so extensive and interesting as to be a great attraction to horticulturists from all parts of Britain, its avenue of the steel blue *Pinus nobilis* being an especial feature; while the enormous extent of the terraces, the fine view of the White Loch, the well-grown araucarias, all contribute to the general effect, and render a visit to Loch Insh a day of great enjoyment. In the extensive piece of water called the White Loch, which stretches for nearly a mile to the west of Castle Kennedy, *Lobelia Dortmania*, *Littorella*, *Scirpus palustris*, etc. occurred. In the round pond grew *Alisma ranunculoides*, var. *subrepens*, which possibly is the *Alisma natans* of the 'Botanist's Guide' recorded from the Black Loch, but in which no trace of it could be found.

Pilularia occurred also, with *Heloseiadium inundatum*, in the round pond. On the ruins of Castle Kennedy *Linaria purpurea* is completely naturalised, as is *Polemonium* in the grounds. In the Black Loch grew *Potamogeton heterophyllus;* while the dry grassy slope, cut into terrace gardens, yielded *Gentiana campestris*, *Aira præcox*, *Lysimachia nemorum*, *Carex præcox*, *Origanum*, and *Orchis pyramidalis*. By the side of the Black Loch *Galium uliginosum* occurred, and *Nuphar* and *Nymphæa* grew in its waters. As to the indigeneity of these latter it is difficult to state.

Between Loch Insh and Innermessan *Hypericum humifusum*, *Arenaria rubra*, *Ornithopus*, grew in plenty; while the sandy and shingly tract of sea-board between Intermessan and Stranraer afforded *Atriplex Babingtonii*, *Silene maritima*, a most profuse growth of *Armeria*, *Plantago maritima*, *Scleroehloa lobacea*, *Honkeneya*, *Sagina maritima*, *S. nodosa* (not the typical form, nor yet the form *glandulosa*), *Plantago coronopus*, *Zostera marina*, *Polygonum Raii*, *Lepigonum salinum*. In a little brook that ran into the sea near Intermessan, *Ranunculus truncatus* grew, and a maritime form of *Fumaria Borœi* was frequent on the shingle. A solitary specimen of *Mentha alopecuroides* grew near Stranraer. This day yielded nearly 50 additional species.

The fourth day was spent in first strolling up the Bree-side above Newton. In the shady woods were gathered *Solidago virga-aurea* (a rare plant in Wigton), *Pyrola minor*, *Luzula sylvatica* and *pilosa*, *Sanicula*, *Geum rivale* and *intermedium*, *Thalictrum* sp., probably *Kochii*, but the achenes had not formed; *Rubus saxatilis*, *Hieracium boreale*, *Asperula odorata*, *Meliea uniflora*, *Chrysosplenium oppositifolium*, *Allium ursinum*, *Trollius Europæus*, *Mercurialis* (rare in Wigton), and a *Melampyrum*, a form of *pratense* so similar to *sylvaticum* as to be mistaken for it, the book description of the species contributing to the error. This had the deep yellow flowers with open mouth of *sylvaticum*, but their size and spreading growth were like *pratense*, to which plant the bracts and capsule brought it. It was quite different from the var. *montanum*. The non-occurrence of *sylvaticum* renders the hybrid theory untenable.* *Galium boreale*, the only mountain and almost the only northern plant, grew at the base of the cliff, but Wigtonshire can scarcely own it as a native, since its home was undoubtedly the high ground of the Cairnsmore of Fleet, from which the seeds had been carried by the Cree. Between Glen Cree and Glenrazie *Silene inflata* was picked in its only locality noticed, and also a pink-flowered form of *Lychnis vespertina*. *Viola lutea*, var. *amœna*, also grew here, and about Challoch a small patch of *Equisetum sylvaticum*. Further work for the day was prevented by my ankle, which had been dislocated in Forfarshire and had been troublesome all along, at length preventing further walking, but about thirty additional plants had been noticed during the morning's walk.

* Since described as *Melampyrum pratense*, L. var. *hians*, Dr.

The fifth day was by train to Whauphill, and then drive to Portwilliam. Along the road *Trifolium medium* was noticed in one place, and *Sambucus nigra* occurred in the hedgerows. At Portwilliam, on the sea-shore and shingle grew in plenty *Carduus tenuiflorus*, *Rosa spinosissima*, and the *Crambe maritima* in great quantity, with ripe fruit, and then small patches of some vetch, which at first from the rigid habit looked like *Orobus*, but nearer inspection showed to be *sylvatica*,* very different from the type: instead of the large rampant plant, "climbing and twisting in tendrilled strength" over the bushes, with thin leaves and white flowers delicately pencilled with blue, appeared a small compact prostrate plant, about two feet across, with coriaceous, glabrous, and frequently glaucous leaves, rigid habit, short peduncles and pedicels, and flowers not nearly so large as type, suffused with a brownish-purple colour; which, despite the crowded state of our synonyms, seems worth varietal distinction, at any rate if such forms as *Lotus crassifolius*, *Sarothamnus procumbens*, or *Genista humifusa* are to be so distinguished. This probably is the plant recorded from the Galloway coast by Prof. Balfour. *Glaucium luteum* occurred at intervals with *Geranium Robert.*, *Convolvulus*, *Soldanella*, &c. In the sandy tracts the maritime form of *Galium verum* (*G. littorale*) occurred, and in the shingle a prostrate growth of *Prunus spinosa*, about six inches high, was plentiful; then on a muddy tract where *Sclerochloa* had formed a turf grew *Carex extensa* in considerable plenty; later on came *Salsola*, and then on the sands near Monreith Bay came *Eryngus maritimus*, *Carex arenaria*, *Erythræa littoralis*, *Carlina vulgaris*, *Erodium maritimum*, *Triticum junceum*, etc. At Monreith on the hillside in damp ground occurred *Juncus glaucus*, *Samolus*, *Anagallis tenella*, *Triglochin palustre*, *Schœnus nigricans* (the latter singularly absent from a great part of the county), *Helianthemum vulgare* (another rarity), *Eupatorium cannabinum*, *Briza minor* (rare), *Rubus cæsius*, etc. On the hill-slopes overlooking the sea in early spring there must have been a profuse growth of *Scilla verna*, here and there the dried capsules still showing themselves, and the tubers could be turned up by scores with little trouble. Returning to Portwilliam and keeping on the hill-slopes, *Equisetum maximum* was found in a curious state; the barren æstival branches bearing at the apex the fertile vernal spike, a form very rarely noticed in Britain. Then came some nice bushes of *Rosa Sabini*, then *Senebiera coronopus*, and shortly before reaching Portwilliam, a discoid of *Senecio Jacobæa*, of rare occurrence. Boswell records it from Wexford and Sutherland; and Sherard in Ray, Syn., 3rd edition, records: "Jacobæa, Flore nudo copiosissime nascens in sabulosis prope littus, tribus vel quatuor millioribus a Drogheda occurrit;" and inspection of the Sherardian specimen showed it to be identical with the Wigton plant. Between Portwilliam and Clone Point *Malva moschata* grew in great plenty; *Lycopsis arvensis* occurred in cultivated fields, and in the grass by the sea-shore *Ranunculus hirsutus*, which I should think to be wild; nearer the town in suspicious localities occurred *Echium*, *Anacyclus radiatus*, *Phalaris Canariensis*, and other introductions.

* Since described as *Vicia sylvatica*, L., var. *condensata*.

The result of the five days' work in the county was the recording of 509 species and 34 varieties, for a detailed list of which I must refer your readers who are interested in the subject to the Report of the Botanical Record Club of the British Isles for 1883.

It may be well to state that Balfour's tour in N. Uist, Harris, and the Lewis yielded 338 records. My own West Ross list contained 373; and Balfour's list of plants seen in the Mull of Cantyre, &c., 456.

SCIENCE-GOSSIP.

Some details have lately been published about the Forth railway bridge. It has been in progress for two years and is expected to take five years more. Some of the girders have been placed upon the piers, though the piers on which they rest are not yet built to their full height, the mode of procedure being to raise the structure gradually by hydraulic power, the masonry being at the same time built up foot by foot beneath it. The metal-work is all of steel. The total length of the bridge will be over a mile and a half; the two main spans 1710 feet each, and the height of the rails above the water 150 feet. The estimated cost is £1,600,000.

In a pamphlet on "The Origin and Reproduction of Animal and Vegetable Life on our Globe," Mr. Thomas Spencer, F.C.S., F.R.M.S., states, among the conclusions at which he has arrived, some which differ more or less from those generally received. He believes that he has discovered "the hitherto inscrutable principle by which life is imparted to matter," not, however, to the exclusion of a Creator. The long sought origin of the life on our globe is to be found in the fact that the acid-forming suboxide or magnetic oxide of iron exists, accompanied by moisture, in every reproductive germ, animal or vegetable, on the surface of the globe; though the author allows afterwards that this wide statement is partly arrived at by analogy. The preservation for ages of moisture in the seed is due in part to the occult action of ozone, which "contains a double atom of oxygen with water and electricity, in combination with some iron." It seems also that at least part of the warmth of the body is due, according to our author, to the heat liberated, along with electricity, at the same time as the moisture in the air inhaled by the lungs is decomposed. There is an air of dogmatism about these statements. They are indeed said to be in no

sense speculative, speculation being reserved till the last few pages. Nevertheless, their variance from commonly received ideas makes one hesitate to accept them at once as truth.

A NEW kind of warlike apparatus has been proposed and was recently the subject of a lecture by Mr. F. A. Gower. The term "air torpedoes" has been used in reference to it, but Mr. Gower prefers "air battery." Directed balloons, or "aerostats," filled with hydrogen from reservoirs of the compressed gas would be sent to attack forces miles away and by exploding shells of gun-cotton over armies, forts, and arsenals, would expose them to danger in a new way. How they are to be directed from so great a distance did not appear in the report. The lecturer proposed thus "to make the loss of an army a result of its meeting with an opposing wind"! It is due to his humanity to add that he considers that, on the simplest principles of self-preservation, nations must keep peace, and great armies be disbanded, a proposition however, which admits of an opposite opinion. But there is little likelihood of the idea being carried into practice at present.

IN the annual Report of the Public Gardens and Plantations of Jamaica for 1883-4 may be found a good many items of interest. It may surprise those who have paid no attention to the subject to know that a descriptive list is given of over forty varieties of the sugar-cane, introduced into the island in 1882, and that this is by no means all it possesses. Jamaica is said to contain about 500 species of ferns, or one-sixth of the ferns of the whole world. A great loss has been sustained in the cocoa-nut trees by the ravages of rats. The rat which causes this damage is the black species, a good climber, smaller than the brown rat of the cane-fields, and building its nest in the trees A method of defending the cocoa-nut trees which has been found satisfactory, is to nail thin sheets of galvanised iron over the trunk, as the rats cannot pass over this. Various fibre plants are discussed. Bananas form the subject of the chief fruit industry, and the mention of these is followed by that of many other things, oranges, vanilla pods, generally said to be the only economic orchid product, and olives, of which a consignment of two hundred plants has been received from Italy and distributed with a view to establishing this plant in the island.

MR. GALTON'S method of composite portraiture has been applied by Professor Pumpelly to obtain type portraits of American scientific men, and the results may be seen in a plate issued by "Science," showing the composite portraits of twelve mathematicians, of sixteen naturalists, of thirty-one academicians, and of twenty-six field-geologists, topographers, &c. The individuals photographed were all taken in the same position, and the camera was so adjusted that the eyes of each sitter were made to coincide with points marked on the ground glass of the camera. The negatives were then photographed successively with an exposure, in the case of the thirty-one, of two seconds each, and a picture thus produced in which the individualities should be almost imperceptible and only the features more common to all brought out. The results show a singular similarity in all the first three groups. "Science" says that one face will be recognised by most of those who review the faces of American men of science as dominating portraits numbers two and three, while Professor Pumpelly says in his accompanying article that the positives of the mathematicians and of the naturalists suggested, independently to himself and many others, the face of an academician who belongs to a family of mathematicians, and that of a deceased eminent naturalist respectively, neither of whose likenesses are included. It does not seem evident why the eyes should be taken as the points for adjustment. No doubt if they were not, a very confused effect might be produced in that part of the face, but on the other hand the distance between the eyes is variable in different faces, the difference being sometimes considerable; and to make the distance always the same must surely be to improve the eyes at the expense of the other features in the composite portrait.

THE April meeting of the Liverpool and District Association of Science and Art Teachers was devoted to microscopy. A short paper on "The Microscope as an aid in Science Teaching," was read by the president, Mr. Norman Tate, F.I.C., followed by a short discussion, after which some time was devoted to the practical examination of microscopes, apparatus and specimens.

INOCULATION for cholera appears to have taken decided root in Spain, and details given by Dr. Ferran, through Mr. Charles Cameron, M.P., seem to show that it may be a means of warding off the fatal effects of the disease. A test experiment has been conducted by Dr. Ferran at Alcira, a town of about 16,000 inhabitants, near Valencia. During the first three weeks of May, 5432 persons had been inoculated. Of the 10,000 and odd persons not inoculated, cholera had attacked sixty-four and been fatal to thirty. Of the 5,432 inoculated, it had, according to Dr. Ferran, attacked seven and not been fatal in any case; or, put otherwise, of the uninoculated, one in every 163 was attacked and one in every 352 died, while of the inoculated one in every 776 was attacked and none died. The circumstances are open to comment, inasmuch as the facts were published by the 20th of May, but it may be presumed that the data were fairly given. The Spanish Government has, however, prohibited Dr. Ferran from inoculating for cholera, pending the result of the inquiries of a commission on the subject.

It is proposed to present a testimonial to Dr. Henry Woodward, to celebrate the "majority" of the "Geological Magazine," of which he has been concerned in the editing during its whole existence of twenty-one years.

From an abstract given in the Journal of the Chemical Society it appears, as a result, of various analyses, that the fallen leaves of maple contain four per cent. of valuable matter (soda, potash, lime, magnesia, phosphorus and sulphur compounds), and poplar and willow five per cent. or more, while various other leaves examined contained 2–2·3 per cent. and that consequently the three above-named constantly manure the surface soil beneath their branches.

From another abstract in the same journal, it appears that some supposed pentanitrodimethylaniline has been shown to be trinitromethylnitraniline. The substance in question had been obtained from naphthyldimethamidophenylsulphone and diphenyldimethamidosulphone.

An account has been lately furnished by Mr. G. E. Walker, F.R.C.S., to a medical contemporary which brings to mind Cheselden's well-known operation. In Mr. Walker's case a girl nineteen years old was operated on in one eye, the other being hopelessly blind. She had been able to perceive light, but could not count fingers with either eye. Several operations were performed at intervals, and Mr. Walker says, "One would have expected that the great benefit which accrued most markedly after each operation would have made her eager to submit, but the contrary was the case. Her first sensation after the admission of light into her eye was one of profound horror. She says now that when she first became conscious of sight, and therefore to some degree of space, her feeling was like that of one who looks over a precipice and feels that he will be impelled to throw himself down, and she at the time bitterly repented her consent to be taken out of the darkness which all her life thus far had enshrouded her . . . The wearing of this [a glass for correction of myopia] speedily caused a change in her state of mind, and she soon ceased to regret her loss of blindness. Under the affectionate tuition of a fellow patient she learned her letters in a day, and to read in a week. Of course this was all the easier from her ability to read with her fingers by Moon's types."

Another practical result of scientific investigation is thus reported by the "English Mechanic." (Mr. Walker (Walker, Parker, & Co., Bagillt), having read the lecture on "Dust," delivered by Professor Oliver J. Lodge, at the Montreal meeting of the British Association, was struck with the results of the experimental passage of electric sparks through dust- and smoke-laden atmospheres, and conceived the idea of applying the principle to the condensation of lead "fume" at the smelting works. Experimental trials gave results so satisfactory that two large Wimshurst machines, with discs five feet in diameter, are to be employed for dealing with the "fume" at the Bagillt works.

A new kerosine lamp has recently been introduced by Messrs. Defries, which claims to be greatly in advance of those in ordinary use. The objectionable features of the diminution of the flame after a lamp has been alight for a short time, the danger of explosion, and the disagreeable smell emitted, are said to be overcome by the Defries Safety Lamp. The light given by the larger size is equal to 61·3 standard candles, and is remarkably white. It is produced by a single wick, and was found to show a diminution from this maximum illumination of only 6·7 per cent. after burning for six hours. The oil consumed per hour is 2450 grains, or 41·6 grains per candle-light per hour. A smaller size is also made, which has a maximum illuminating power of 42·4 standard candles. These figures are given upon the authority of Mr. Boverton Redwood, F.C.S., F.I.C., by whom the lamps have been tested, while Sir Frederick Abel considers that the Defries Lamp embodies all the features which exhaustive scientific enquiry have proved to be necessary for the perfectly safe use of mineral oils.

MICROSCOPY.

The "Journal of the Quekett Club" for June contains a good deal of interesting matter. The first paper is an account by Mr. F. A. Parsons, F.R.M.S., of a New Hydroid Polyp, found by him in a tank at the gardens of the Royal Botanic Society of London. He at one time thought it was the same as was found last autumn by Mr. A. G. Bourne, in the *Victoria regia* tank there, and supposed to be the polyp stage of the Medusa *Limnocodium Sowerbii*, but whether it is so or not does not seem to be at present clear. The paper is illustrated by a plate shewing different conditions and stages of development of the polyp. Papers follow by Mr. F. H. Buffham on Newly-Observed Phenomena in the conjugation of *Rhabdonema arcuatum*, a diatom which grows in filaments attached to marine algæ, and by Dr. M. C. Cooke on Some Remarkable Moulds, one of which was found in the meatus auditorius of the human ear. Among the Proceedings may be found some remarks by the president, Dr. W. B. Carpenter, on the Binocular Microscope. He said there was a very curious thing about the Binocular Microscope, that it increased very greatly the focal depth. This was to be explained partly, but not wholly, by the binocular prism halving the aperture of the objective. He had talked the matter over with Sir Charles Wheat-

stone, but they could never come to any satisfactory conclusion. At the same meeting the president spoke of the discovery by Professor Moseley of eyes imbedded in the actual shell of a Chiton. Dr. Carpenter had himself detected forty years ago passages in the shells of Chitons, and it is now found that the larger perforations contain very perfect simple eyes. This number of the journal contains also Notes of Demonstrations by Dr. M. C. Cooke, on Collecting, Examining, and Preserving Fresh-water Algæ, and by Dr. T. Spencer Cobbold, F.R.S., on Lung Parasites.

COLE'S MICROSCOPICAL STUDIES.—Three more slides belonging to this series have been received and not yet noticed, accompanied by the usual explanatory text, viz. vertical section of thallus and apothecium of *Sodorina crocea;* transverse section of leech, *Hirudo medicinalis;* and section of lung, broncho-pneumonia.

CHOLERA BACILLUS.—The short notice at p. 42 of SCIENCE-GOSSIP for this year demands attention. Professor Ray Lankester maintains that the comma bacillus is a spirillum. Assuming it to be the cause, either directly or indirectly, of cholera, this view would support those held by persons who regard cholera as an acute fever. But is this spirillum view maintainable? Koch cultivated the comma bacillus successfully. Its action in cultivation fluids is characteristic and marked. The bacillus obtained in fluids was always the comma bacillus. A fragment of a spirillum containing spores would develop into perfect spirilla; but for disintegrated spirilla always to develop into disintegrated spirilla, and for all these disintegrated spirilla to resemble each other, and to be identical with Koch's comma bacillus, does, I think, throw doubt on the accuracy of Professor Lankester's view.—*W. J. Simmons, Calcutta, 16th April*, 1885.

ZOOLOGY.

CONCHOLOGICAL NOTES.—The following varieties may be added to the British list:—1. *Helix Cantiana*, var. *minor*, Moq. SCIENCE-GOSSIP, 1885, p. 15, var. 17. This might be mistaken by the inexperienced for *H. Cartusiana*. 2. *H. nemoralis*, var. *interrupta*, Moq. Bands interrupted. Chislehurst. This form is better expressed by using a colon for an interrupted band in the band-formula, thus: 1:345. 3. *H. nemoralis*, var. *studeria*, Moq. Lilac, bandless. SCIENCE-GOSSIP, 1884, p. 236. 4. *Cyclostoma elegans*, var. *pallida*, Moq. SCIENCE-GOSSIP, 1885, p. 15, var. 14. 5. *C. elegans*, var. *albescens*, Moq. "Whitish, without markings." The specimens I have seen have not been absolutely without any traces of bands or markings, but these have been so very indistinct, and the shell so white, that they cannot be separated from *albescens*. "Zoologist," 1885, p. 12. Mr. Baker Hudson, in a recent number records two varieties of *Limax flavus*, var. *virescens* and var. *colubrina* as occurring near Middlesbro', but he gives no description of them. Since they are not described in the British works, it will be just as well to give their descriptions now. Var. *virescens*, Moq. is yellowish without any markings, while var. *colubrina* is (Mr. Roebuck informs me) also yellow, but has black markings on the mantle and on the body.* The typical form of *L. flavus* is intermediate between these two, and Moquin-Tandon describes a var. *flavescens*, with very indistinct markings, which bridges between the type and *virescens*. In the above varieties the ground colour is yellow; but this is not always the case, for var. *grisea* has it grey, and in France the varieties *rufescens*, reddish, with very indistinct markings, and *maculata*, brown, with black markings, have been found.—*T. D. A. Cockerell, Bedford Park, June* 4.

ARRIVAL OF SUMMER BIRDS.—The "Naturalist" for June, contains a list of observations of the first notices of twenty-eight summer visitant birds in the North of England, from which it appears that the swallow was noted at Nottingham on April 13th, the nightingale at Bourne, S. Lincolnshire, on April 16th, and the cuckoo at Flamborough Head on April 17th.

NOTES ON FISH-LIFE.—In the June number of the "Annals and Magazine of Natural History," Professor M'Intosh contributes from the St. Andrews Marine Laboratory notes on the spawning of certain marine fishes. These include the herring, the ova of which he believes hardy enough to take but little harm from being hauled on board by the trawl and afterwards tossed into the sea; viviparous blenny, of which in one case at birth the young of a very large adult (15 in.) measured nearly 5 inches (a very similar case is mentioned in Yarrell); the cat-fish and others. It is considered that pelagic or floating eggs do not probably float by virtue of their oil-globules, since some float without oil-globules, while the abundance of oil in some other cases does not cause the eggs to float.

VORTICELLÆ WITH TWO CONTRACTILE VESICLES.—In the "American Naturalist," Dr. A. C. Stokes says that besides *Vorticella lockwoodii*, which he described last August, and which was the first recorded instance of the presence of more than a single pulsating vacuole in the Vorticellæ, *V. monilata*, Tatem., a species originally discovered in English waters, and not uncommon in Europe and America, also possesses two contractile vesicles.

* The original description is "Animal flavum. Clypeo dorsoque late ac irregulariter nigro-maculata: interstitiis flavis maculas nigras æquantibus" (Lessona and Pollonera)."

BOTANY.

Apospory in Ferns.—An important advance has lately been made in the knowledge of the life-history of ferns, and communications on the subject from Mr. Charles T. Druery and Mr. F. O. Bower, may be found in the "Journal of the Linnean Society." In the place of the sori on *Athyrium Filix-fœmina*, var. *clarissima*, a plant of which was originally obtained wild in Devon, Mr. Druery found little flask-shaped or pear-shaped bodies situated within an undoubted indusium, but at this stage no spores or spore-cases could be detected. On pinnæ of the fern being imbedded in soil under suitable conditions, these bulbilloid bodies began to develop, and in less than three months decided prothalloid forms were produced, on which archegonia and an antheridium were afterwards found. Small fronds at length projected from the bifurcation of the prothallus. Mr. Druery considers that they had evidently developed from the archegonia by the ordinary method, though the prothalli themselves had sprung from something very different from spores. Mr. Bower confirms Mr. Druery's results and also mentions the case of *Polystichum angulare*, var. *pulcherrimum*, in which there are undoubted prothalloid bodies formed by purely vegetative growths from the tips of the pinnules, and without any connection with sori, sporangia, or spores, and which bear antheridia and archegonia. The discovery of this was due to Mr. G. B. Wollaston. The ordinary series of conditions is thus even further broken in upon in the case of the Polystichum than in that of the Athyrium, since in the cycle of the former there is nothing in the place of the bulbilloid growths of the Athyrium or of the normal sporangium. The antheridia and archegonia of the Polystichum were not found to be open while the prothalloid structures were on the leaves, the cause assigned as probable being the want of the necessary moisture.

Diatoms and Bladderwort.—Mr. Henry Taylor has forwarded a slide containing a bladder of Utricularia upon or within which are to be seen numerous frustules of diatoms, upon the decomposing endochrome of which he thinks the plant may have fed. He says that Mr. Darwin, who does not in his work on Carnivorous Plants mention Diatomaceæ being found in the bladders of any of the species, "appears to think the taking in of food by the bladders is not owing to any voluntary act on their part, but that the different things found in them have merely forced their way in; but as many of these diatoms are stipitate and attached forms, having no power of locomotion, like the free frustules, this looks very much like their being seized by the antennæ round the valve of the bladder and conveyed or swallowed in. I may add that the specimen I examined is a dried one, which has been in my possession, in that state, for at least twenty years—therefore not in a very good condition for examination. I am very anxious to obtain some in a fresh state, and should be much obliged if any one will inform me of a locality (near London) where it can be found." Mr. Taylor is not however certain whether the diatoms are inside or outside the bladder, and even if they be inside it still remains to be shewn that they are utilised as food by the plant. Mr. F. Kitton, F.R.M.S., has been kind enough to give his opinion as to the position of the diatoms. Speaking about the one slide forwarded, Mr. Kitton says: "The diatoms are, I have no doubt, upon the bladder of the Utricularia as the species are all parasitic (and no doubt occurred on other parts of the plant), they could not have been injected by the bladder as it possesses no prehensile organs which would be necessary to detach the diatoms from their stipes. . . . The following are the species attached: *Gomphonema constrictum*, *Synedra capitata*, *Cocconema lanceolatum*, *Diatome vulgare*." The point is one however of some interest, and it would be well if it were thoroughly cleared up by means of the examination of fresh specimens.

GEOLOGY, &c.

Carboniferous Flora.—In "The Annals and Magazine of Natural History" for June, is a paper by Mr. Robert Kidston, F.G.S., on some "Fossil Plants from the Lanarkshire Coalfield." Mr. Kidston is intending to work out the distribution of the carboniferous flora, and will be glad if others who possess specimens of carboniferous fossil plants will allow him to examine them, and he, on his part, will be glad to help students in this department.

Dr. Callaway on Comparative Lithology.—In a paper entitled "A Plea for Comparative Lithology," contributed to the "Geological Magazine" for June, Dr. Callaway, F.G.S., returns to the question of mineral composition, and refers to a paper read by him before the Geological Society, of which a notice may be found on p. 117 of this volume. He thinks that lithological resemblances may be pointed out without necessarily correlating the rocks thus shewn to be similar, while, on the other hand, we need not always wait for ocular demonstration before venturing to correlate. Though the mineral composition of Post-Archæan strata may not be of much value, nor serve, even if fossils were absent, to establish a law of correlation, the same is not the case with the Archæan rocks, and Dr. Callaway believes there are grounds for the "conclusions that, in the British area at least, crystalline schists have not been manufactured on a large scale in Post-Archæan times, and that, amongst the

Archæan rocks, the antiquity of a schist is in direct ratio to its degree of crystallization. I do not say 'degree of alteration,' because this would involve a theory, and introduce complication." For the suggested law he does not claim more than an empirical and local value. He starts with the proposition, "that in Britain there occur (at least) two Archæan groups, of which the older is coarsely crystalline, and the younger either eruptive or hypocrystalline. These are the Hebridean and the Pebidian." After giving evidence from Shropshire, Anglesey, North and South Wales, and (in some detail) from Ireland, Dr. Callaway says that while some regard Archæan studies as barren and unpromising, he thinks they open out fruitful fields of labour, and that workers at them "are working at the great question of the origin of the crystalline schists, and striving to throw light upon some of the earlier chapters in the earth's crust."

NOTES AND QUERIES.

A Pair of Comets.—The "West Briton" (Truro) of January 8, contains the following letter:—Astronomers have rarely witnessed the appearance of a pair of those mysterious travellers of the starry depths, hand in hand, or like the Siamese twins, Eng and Chang, hip by hip. But Bodmin last week offered a favourable situation from which to observe such a rare phenomenon, and for the sake of those who were inconveniently placed I send a few notes which I shall be glad to compare with any taken by brother amateurs. I first noticed the twins in the darkest part of the northern heavens. The path was one of more than usual eccentricity, and the pace a headlong one. Donati's comet in 1858 passed round his solar majesty superbly, and assumed the most graceful curves. But, on the contrary, each of the pair in question, on nearing the sun, was visibly agitated, and underwent a series of remarkable contortions. If, for convenience' sake, we term one B, and the other C, then on attaining the point of nearest approach to the sun, C threw out three separate and distinct tails, in one of which B got entangled and finally disappeared. When receding, each tail in turn faded and was lost to view, . . . The nucleus of each and of the affiliated mass was of the usual ethereal lightness, and stars of small magnitude were distinctly visible through their very centres. My observations go to confirm the beliefs that, first—no cometic substance is sufficiently dense to visibly disturb the sun or any of his satellites; and second—no cometic substance can too nearly approach the sun or his satellites without sustaining loss or harm.—*Arcturus, The Observatory, Bodmin Beacon.*

Is the Water-Ousel an Enemy to Fish?—I think it may be well to direct your readers' attention to a very emphatic declaration on this point, in the latest volume (ORN–PHT) of the new "Encyclopædia Britannica," produced early this year. The description of the dipper (article "Ousel") contains the following passage: "By the careless and ignorant it is accused of feeding on the spawn of fishes, and it has been on that account subjected to much persecution. Innumerable examinations of the contents of its stomach not only have proved that the charge is baseless, but that the bird clears off many of the worst enemies of the precious product." This decided statement, in a work of such authority, ought to be warmly welcomed and widely circulated by all friends of the mysterious little bird whose character it tends to re-establish. Nearly all modern naturalists have repeated unhesitatingly that the dipper is a great destroyer of fish-spawn, and I am afraid nearly all river-fishers are strongly prejudiced against it, one of the most interesting and easiest to exterminate of all our native birds. Can any of your correspondents say whether the dipper ever touches seeds of any kind? From its relationship to the thrushes, I should have suspected that it might occasionally prove a berry-eater; and the scarlet fruit of the cuckoo-pint, to which "birds of the thrush-kind" are supposed partial, is sometimes extremely abundant along the banks of a dipper-haunted stream. Considering how few of our non-migratory birds are purely insectivorous, it seems difficult to imagine so aquatic a species as this ousel would abide our bitterest winters without some capacity to digest vegetable food.—*C. B. Moffat.*

The Clouded Yellow (*Colias edusa*).—In 1877 this butterfly appeared very abundantly in the neighbourhood of Louth, frequenting the banks by the roadsides, the railway cuttings, and other similar situations. But, I believe, not a single specimen has been captured or seen here since that year. Will some reader of Science-Gossip kindly inform me whether this insect has been plentiful in any of the more northern counties of England since 1877? And what were the "Edusa years" prior to that year?—*H. Wallis Kew, Louth.*

Caterpillars feeding by Night.—Very many caterpillars, principally belonging to the Noctuina group, feed solely at night, or very early in the morning, before the sun is up. I have noticed that the larvæ of the carpet moths (Melanippe) are nocturnal feeders, but some, at least, of the Geometrina feed by day, and most of the Bombycina do so likewise. I do not think it is an invariable rule that butterfly larvæ show a preference for feeding in the daytime. I am rather inclined to think that all caterpillars feed at night, those of butterflies as well as those of moths.—*Albert Waters.*

Water Voles.—Mr. J. A. Wheldon says: "I don't wish for one moment to say that a vole would not touch a piece of flesh if it could get nothing else, though that remains to be proved. I should think it need not long remain to be proved, for if some practical naturalist who can obtain a water vole for a day or two would do so, he would soon elicit proof, without any great amount of pain to the animal. I would have done it myself, but unfortunately I am not in a position to get hold of a vole. Our old Yorkshire proverb says, "an ounce of doing is worth a ton of talking."—*H. Snowden Ward.*

Cats and Kittens.—I shall be glad if any of the readers of Science-Gossip can tell me if the following is usual or no. Our cat lately had four young ones, three of which we destroyed, and a kitten of hers, about a year old could not bear the sight of the new animal, would not feed with the old one, or come near it, or any of us. About three days afterwards she suddenly took a turn, came and played with the kitten. The three slept together, and now the young one is acting the part of guardian, and is more motherly than the mother (this young kitten has had none of her own).

If I take the kitten away and hide it, it is the young one who comes after it. Last night I placed it under a soft hat in the passage. When it cried they both came to seek it, the old one at a loss what to do. The young one, after walking round the hat two or three times, lifted it up and carried it into their cupboard, the mother most complacently following and quite contented with the self-imposed nurse.—*W. A. Pippet*, *Didsbury.*

FERTILISATION OF ORCHIS MASCULA.—Mr. Malan, in his excellent article, is evidently at home on the subject generally. His new idea, however, that the pollen masses without the usual depression would strike on the stigma cannot be accepted as wholly correct, simply because it is averse to actual experiments. That the position of the pollinium when newly removed is more nearly at right angles than in an upright position, as stated by Mr. Malan, also requires modification by the contraction and downward movement not due to hygrometric action. Would Mr. Malan kindly let us know if he has ever noticed any evil effects produced on insects by removing the pollen masses?—*A. D. W.*

LATE FOLIAGE AND NESTING.—The foliage has been so late in appearing in this part of the country, that many birds which usually build in hedges have actually made their nests on the ground. I have found two blackbirds (*Turdus merula*), a song-thrush or throstle (*Turdus musicus*), and a hedge-sparrow (*Accentor modularis*) in this position.—*Geo. H. Brocklehurst*, *B.Sc.*, *Roundhay*, *near Leeds.*

PIED FLYCATCHER — KITE — UNRECOGNISED BIRDS.—I have been informed by a friend that he saw a male pied flycatcher near Abergwessin, Breconshire, on May 1st. This bird is not recorded in Yarrell as having been observed in South Wales. My friend also observed in April, within a few miles of the same place, a pair of red kites (*Milvus Ictinus*) and nest. The unrecognised birds, p. 69, may have been rollers or bee-eaters.—*R. Egerton.*

THE PIED FLY-CATCHER.—Last week, one pied fly-catcher was observed in the village of Pantperthog, Merionethshire, and last spring, one was seen at Llwyngwern, in the same neighbourhood.—*M. E. Thomson.*

CURIOUS SPORTS IN A WALL-FLOWER.—There is now growing at St. Albans a wall-flower of average size and growth, and well bloomed, but every flower is malformed. The sepals remain unchanged, but the petals are mere narrow strips, resembling the sepals in colour, and only about one-fourth the size. All the stamens are transformed into capillary leaves, adhering at their edges and enclosing the ordinary pistil. Instead of an anther, each stamen is tipped with a well-developed stigma. The ovary thus contains six or eight cells consisting of the ordinary double celled ovary, and four or six others surrounding it. The ovules are well-formed in all the compartments, but are not yet sufficiently matured to show if they are fertilised. This is the second year the plant has bloomed, and it remains true to its variations.—*G. Bird*, *Sydenham.*

THE COLOUR OF THE RED SEA.—Immediately upon reading Dr. Stonham's paper on the "Colour of the Red Sea," I communicated with my cousin, the senior naval engineer at Souakin concerning it, forwarding at the same time Dr. Stonham's remarks. This is what he says: "I kept a look out for the red streaks described by Dr. Stonham but without any results; nothing was observed but the ordinary blue, and I asked our navigator, who had been out here before, if he had ever observed anything of the kind, but he had not. Perhaps it is more noticeable in the Gulf of Aden. Dr. Stonham's statement that it in very seldom rough in the Red Sea I take the liberty of doubting entirely. From the experience of all our fellows on board, the normal condition of affairs in that part of the Red Sea between Suakin and Suez is from half a gale to a gale, and as it generally blows from the N.N.W. it raises a very nasty sea." I have heard friends who have voyaged to New Zealand, &c., describe these "bands" in the Southern Seas. Perhaps they are common to Oceans, and like the confervoid algæ of our ponds and ditches appearing only in their proper seasons, plentiful one week, gone the next.—*Harry Moore.*

THE CROSS-FERTILISATION OF GRASSES.—On a summer's eve as the swift-moths (*Hepialidæ*) dart hither and thither among the tops of the grass at a time when it is in full flower, they must brush a large quantity of pollen off with their wings, and abundantly scatter and distribute it, and as they are very common it is easy to conceive the possibillity of a whole meadow being fertilised, even though a dead calm might last for days, and not a breath of air come to disperse the pollen dust. We may thus see how insects may have a part in the fertilisation of even anemophilous plants. Moths also dart about among the ears of wheat and other corn.—*Albert Waters.*

MISSEL THRUSH'S NEST.—There is, in an apple-tree of a much frequented garden of this neighbourhood the nest of a missel thrush (*Turdus viscivorus*), the peculiarity about it being that it is almost totally composed of odds and ends of thick string, which remained over from some which had been used for tying up flowers. Owing to many of the strings being nearly a yard long, a curious and untidy appearance was given to the nest.—*J. C. S.*, *Edenhall.*

FUNGOID DISEASE IN FISHES, &c.—Having given some attention to aquarian pursuits, my success has been somewhat marred by the appearance of this malady amongst my specimens—although kept in several distinct tanks. Sooner or later it always ends in death. Even the *Siren pisciformis* (Axolotl) does not escape its ravages. The water employed is from the Cotswold Hills and is rather hard, containing considerable lime. Can this fact be the cause of the trouble? Will any of your experienced readers be kind enough to give me some hints as to the origin of the disease, and the best way of avoiding or curing it.—*Hal.*

PAULOWNIA IMPERIALIS.—I enclose some flowers of the *Paulownia imperialis*, a tree said by authorities never to flower in England, the buds of which are naked on the tree all the winter, developing early in the spring, and then being withered before the maturity of the flower, by the east winds. The tree in question is growing here in a garden, and is about twenty feet high. I have watched it carefully for some years in hope of flowers, but, till now, it has never fulfilled my wishes. I attribute the rare occurrence of flowers this year to the fact, that the buds have been kept back by the continuous cold weather we have had this spring, and that when the burst of heat came on the last of May, and which has lasted since, the buds suddenly arrived at perfection without any cause to wither them, and yesterday the flowers began to open, and to-day the tree is a mass of lilac bloom.—*Dunley Owen.*

RANA ESCULENTA.—Years ago, when the late Professor Henslow used to organise botanical excursions around Cambridge, I was delighted to join the party, though my explorations were not directed so much to plants as to the lower forms of animal life. During these excursions I remember we found this "edible frog" in one part of Cambridgeshire, though not in large numbers, seeing that the country folks were quite awake to the fact that this particular frog was "uncommon good to eat." I could not find out whether the village "gourmets" restricted themselves, as is usual on the continent, to the hinder extremities only, as a matter of diet, neither could I learn that this undoubted *Rana esculenta* had ever been collected for sale. Perhaps it was as well the people did not know its value. . . . For obvious reasons I do not name the habitat of this frog in Cambridgeshire, but assuredly there was no suspicion at that time, as in the case of Norfolk, that the *Rana esculenta* had been "turned up" in a remote part of the county as a matter of acclimatisation.—*John Anthony, M.D. Cantab., F.R.M.S., Edgbaston, Birmingham, June 8th,* 1885.

CANINE SAGACITY.—I saw a retriever do a clever thing last week. He wanted to get through the swing drive gate leading to the house of his master. He stood upright, bent his forelegs at a right angle, placed them over the horizontal bar half way up the gate, and tried vigorously to pull it open—succeeding to some extent, he loosed his hold suddenly and tried to go through with a rush. Twice was the gate too quick for him in swinging to, but on attempting a third time and pulling "like a bargee," he managed to carry out his idea. I am since informed that he never attempts this method of entrance if he sees the gate is really latched.—*Alf. Freer, Stourbridge.*

HOLLY AND IVY LEAVES.—F. W. Elliott, in the June number of SCIENCE-GOSSIP, asks for an explanation of the cause of the upper leaves in old hollies and old ivy losing their characteristic shape. The real reason of their altered shape is simply the lack of strength arising from old age to form leaves of the normal type. As every one is aware the leaves of evergreen trees and shrubs are of a more substantial character than those of deciduous kinds, and this doubtless involves a greater proportionate strain upon their recuperative energies than in the other case, hence the deteriorated condition of the upper leaves in old specimens.—*J. F. Cranswick.*

FERTILISATION OF ORCHIS MASCULA.—If Mr. Malan will look up "The Garden" of May 23rd last, he will there, at page 464, see the following note which quite upsets his theory that the breaking of the stem of *O. mascula* affects the flower of the new tuber:—"I send you a spike of *Orchis mascula*, being the third in succession that has been annually cut from the same plant and sent to 'The Garden' office. This surely proves that cutting the flowers of some Orchids at least is not injurious, but really beneficial, for you must admit that the present spike is the first that has yet been sent." The descending of the tubers so as to prevent premature germination is a rather laughable idea.—*A. D. W.*

SNAILS AND SLUGS.—I have noticed that in my garden in a large town snails are very common, and that there are but few slugs. In my garden in the country I found that there were but few snails and very many slugs. Is there any natural reason for this distribution of these creatures between town and country? Is my supposed fact true, and have others noticed it?—*A. C. Smith.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

R. O. O.—Soak the nests in benzine for a few minutes, and afterwards keep a little camphor in or near them.

C. C.—Yours received.

W. R. WAUGH.—Thanks for your suggestion. It is a good one, and has been noted for consideration.

A. S. MACKIE.—Both probably *Helix nemoralis.*

THOS. WINDER.—Bird cherry (*Prunus Padus*).

F. W. LEAN.—The small bone is very likely one of the "ear bones."

S. J. H.—"Freshwater Algæ" is now complete in 2 vols., with coloured plates, published by Williams & Norgate, Henrietta Street, Covent Garden. This is on the authority of the author.

W. R. N.—1. Dried up. 2. *Luzula campestris.* 3. Unknown. 4. Dried up.

J. WALTER GREGORY.—Please send your address.

T. B. BIRCHALL.—There are articles by Mr. Edward Lovett on the Fauna of Jersey in Nos. 202, 208, 210, 211, 236, 237, of SCIENCE-GOSSIP, and on the Geology in Nos. 204, 206, but he did not take up the Botany. There is a botanical note of a few lines in No. 173. See also "Flora of Channel Islands," by C. C. Babington (Longmans) 4*s*.

EXCHANGES.

GOOD botanical, histological, crystals, polariscopic, diatoms, fish scales and miscellaneous, microscopic slides for others as good of bacilli, entozoa, algæ, desmids, zoophytes, rocks, fossil woods.—B Wells, Dalmain Road, Forest Hill.

A NUMBER of superior slides of general interest to be exchanged for other well-mounted slides or good books. Lists exchanged. For feather of starling, a splendid object, perfectly mounted, send one well-mounted slide.—J. W. Tutcher, 22 North Road, Bristol.

WANTED, Morris's "British Birds;" will give books.—F. Marshall, Benwick, March.

COINS or books wanted in exchange for microscope slides.—Mr. Ebbage, 8 Lowfield Street, Dartford.

FOR exchange, SCIENCE-GOSSIP for 1881–1884, and up to date, plates complete, all clean, first three bound; also Cooke's "Rust, Smut, Mildew, and Mould," coloured plates (nearly new), and "Micro Fungi: When and Where to Find Them," for chemical apparatus and books on analysis.—George Ward, 26 Mere Road, Leicester.

WANTED, Lepidoptera: Sinapis, Egeria, Megæra, Tithonus, Davus, Alsus, Acis, Arion, Adonis, Ægon, Agestis, Artaxerxes, Actæon, Comma. Duplicates: Cardamines, Galathea, Semele, Hyperanthus, Antiopa (Continental), Euphrosyne, and Selene (this season's), also Filipendulæ, Jacobeæ, and Humuli.—F. A. A. Skuse, 27 Campbell Road, Bow, London, E.

FORAMINIFEROUS sand. Send stamped and addressed envelope for some of the above, containing splendid objects for the microscope, to—F. A. A. Skuse, 27 Campbell Road, Bow, London, E.

RYE'S "British Beetles," Stephens' "British Beetles," Newman's "Moths," Burmeister's "Entomology" (33 plates), Prior's "Popular Names of British Plants." What offers in exchange?—W. Jordan, Cockfield, Sudbury, Suffolk.

WANTED, the back numbers of SCIENCE-GOSSIP, from the beginning up till end of 1876; will give eight good and well-mounted micro-slides for each year's parts.—J. J. Andrew, L.D.S.M., 2 Belgravia, Belfast.

A NUMBER of foreign Polyzoa, mounted, dry, and opaque, to exchange for other slides or good material; good diatoms preferred.—Send lists to—Rev. A. C. Smith, 3 Park Crescent, Brighton.

DAVIES's "Welsh Botanology," 1813, Sole's "Menthæ Britannicæ," 1798, Hooker and Taylor's "Muscologia Britannica," 1827, and many others, for natural history text-books or offers. —J. Harbord Lewis, F.L.S., 145 Windsor Street, Liverpool, S.

"How to Work with the Microscope," by Dr. Beale, third edition, and two vols. "English Mechanic;" also a few good opaque slides, exchange for Miss Pratt's "Wild Flowers," or other well-illustrated botanical or microscopical books.—Jas. C. Blackshaw, 4 Ranelagh Road, Wolverhampton.

WANTED, good micro slides (no physiological) or scientific works in exchange for four vols. of "Pictorial World" (xi.–xiv.). —R. Ridings, 1 Hampton Terrace, Lisburn Road, Belfast.

WANTED, specimens of uncleaned Diatomaceous earths, containing any of the well-known forms of Diatoms, &c., either English or foreign. Can give either mounted or unmounted prepared material in exchange, consisting of botanical sections or anatomical objects, or various preparations.—R. M., 59 Hind Street, Poplar, London, E.

FRESHWATER filamentous algæ, comprising the Zygonemaceæ; exchanges of mounts or gatherings wanted.—C. Peek, Princes Road, Heaton Moor, Stockport.

WANTED, SCIENCE-GOSSIP from beginning of 1865 to end of 1884, either bound or in loose numbers; and also any other microscopical books or journals. State what is wanted in exchange for them.—Charles Von Eiff, jun., 347 Greenwich Street, New York City.

EGGS of osprey, cuckoo, woodpecker, colin, grouse, rail, heron, grebe, tern, gull, and petrel, offered for others not in collection.—J. T. T. Reed, Ryhope, Durham Co.

FINE collection of foreign and British shells, 750 species; also collection of rocks and fossils, most formations, 1500 specimens, some duplicates; want good binocular microscope.—C. T. Musson, 23 Mapperley Hill, Nottingham.

WANTED, the number of "Nature" containing Index to Vol. XIII., to complete set. Some old numbers of "Punch" in exchange.—W. White, 55 Highbury Hill, N.

To foreign stamp collectors. I have over 1400 stamps, mixed kinds, which I will send in exchange for five or six balsam mounted slides, not being a collector myself.—Mr. Ebbage, 8 Lowfield Street, Dartford.

WANTED, in good preservation, Edward III. half noble; Richard II. quarter noble; Henry V. noble; Henry VI. noble and half noble; Edward IV. noble and half noble, and half angel; Henry VII. angel; Henry VIII. angel and quarter angel, in exchange for micro slides (histological and morphological).—B. Piffard, Hill House, Hemel Hempstead.

A COLLECTION of six skulls (five human and one gorilla) in exchange for microscope, natural history books, &c.—J. W. Whitehead, 10 Seedley Park Road, Pendleton, Manchester.

Rhyncospora alba, Vahl; will send a specimen of this sedge, from Arisaig, Invernesshire, to any one who will write to me for it.—A. Somerville, 34 Granby Terrace, Hillhead, Glasgow.

WANTED, Herbarium specimens of the rarer British zoophytes such as *S. fusca, D. pinnata, N. bursaria, P. myriophyllum, A. pennatula, B. Murrayana*, &c.—A. S. Pennington, Heaton, near Bolton.

FIFTY-THREE parts of "Monthly Microscopical Journal," clean, edited by Lawson; pair of buffalo horns, 6 ft. 5 in. tip to tip. What offers in well-mounted slides?—W. T., 258 Newtown Row, Birmingham.

"PHYSICAL GEOGRAPHY," Geikie; "Physiography," Findlater; "Half-hours in the Tiny World;" for "Lessons in Elementary Physics," Balfour Stewart; "Elementary Lessons in Physical Geography," Geikie; or "Popular Astronomy," Airy. —F. Hendry, 11 Poplar Street, Bolton.

EGGS of pheasant, jackdaw, magpie, starling, redstart, chaffinch, missel thrush, wood wren, longtail tit, &c., in exchange for other eggs or butterflies.—James L. Mott.

WHAT offers for eighty numbers of SCIENCE-GOSSIP?—X., Stratfieldsaye, Winchfield.

WANTED, micro slides or geological specimens in exchange for "Zoologist," 1880, bound, new.—C. Rowland, 36 The Grove, Ealing, W.

WANTED, "The Smaller British Birds," by —— & Adams, published by Bell & Sons; also various kinds of scissors for scientific and other purposes, in exchange for shells, fossils, lepidoptera, plants of cacti, exotic ferns, &c.—M. A. O., 82 Abbey Street, Faversham, Kent.

WANTED, microscopic slides in exchange for nine bound vols. (xi. to xix.) of "Chemical News," all in good condition.—B. H. Woodward, 80 Petherton Road, London, N.

WANTED, a good secondhand "C" eyepiece, $1\frac{1}{16}$ in. tube for monocular microscope.—W. Henshall, The Hollies, Bredbury, near Stockport.

WANTED, good fresh specimens of *Actæa spicata, Matthiola sinuata, Impatiens noli-me-tangere, Hydrocharis morsus-ranæ, Stratiotes aloides, Vaccinium oxycoccos*, roots not wanted.—Miss Higgins, 93 Wellington Street, Luton, Beds.

ALPINE knapsack, good condition, only used once; desiderata good micro slides, and British birds' eggs.—John R. Marten, The Pharmacy, Red Hill.

WELL-MOUNTED slides of seeds, love-lies-bleeding, *Silene pendula, Collinsia bicolor, alba*, Eschscholtzia, *Geum coccineum*, and *Caynus minor*, in exchange for other micro slides. —W. S. Anderson, 7 Granby Street, Ilkeston.

NOS. 80, 81, 82, 83, Aug. to Nov. 1871, SCIENCE-GOSSIP; vols. 15, 16, 19, 20, and 21 of "English Mechanic;" Nos. 138, 139, 140, Jan. to March, 1875; vol. for 1874; viz. vol. 7, bound, of Newman's "Entomologist." Unaccepted offers not replied to.—Whitmarsh, 5 North Street, Wilton.

SIX good insect mounts: gizzard of cricket, eggs of vapourer moth, tongue of honey bee, whole flea, antenna of earwig, and wing of caddis fly, in exchange for other good micro slides.—W. S. Anderson, 7 Granby Street, Ilkeston.

OLD-FASHIONED microscope, stands 17 inches high, not quite perfect; will exchange for microscopic material.—S. J. Tindall, 5 Ballater Road, Acre Lane, Brixton.

CAN offer ten vols. of SCIENCE-GOSSIP, a small microscope, Clark's "Marine Mollusca," and a large series of shells. Wanted, works by Professor Ruskin, back numbers of "Journal of Conchology," British shells, or offers.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

OFFERED, "The Gardener's Magazine" (1884); desiderata; any of the following vols., ii., iii., and v., of "Science for All." —A. Ayling, Arundel.

OFFERED, "The Garden" (1884), 53 beautifully-coloured plates and engravings; desiderata; any two of the following vols., ii., iii., and v. of "Science for All," and other natural history books to value.—A. Ayling, Arundel.

I HAVE just received from Mauritius some fresh material of the beautiful leaves of *Borago Zeylanica*, hairs on stellate calcareous plates. Send lists to—Rev. A. C. Smith, 3 Park Crescent, Brighton.

LYELL'S "Student's Elements of Geology;" "Advanced Text-Book," by Page; Richardson's "Geology;" "Astronomical Geology;" Waterton's "Natural History Essays;" "Birth of Chemistry," Rodwell; "Zoologist" for 1883; and good Lias fossils, to exchange for Reeve's or Rimmer's "Land and Freshwater Shells," entomological books, or offers.—H. Quilter, 4 Cedar Road, Leicester.

WANTED, fossils of any formation in exchange for those from the Portland Oolite.—C. Fred Fox, Strathearne Villas, Old Swindon, Wilts.

WANTED, microscopical or natural history books in exchange for well-mounted micro slides or offers.—Alfred Draper, 275 Abbeydale Road, Sheffield.

WILL exchange in clutches or single eggs of rook, ring dove, mallard, moorhen, coot, blackheaded gull, peewit partridge, meadow pipit, also nest of gold crest.—J. R. Murray, 10 St. Paul's Street, Aberdeen.

WANTED, coins, medals, tokens, foreign stamps, arms, armour, flint implements, canaries, pigeons, in exchange for fossils, seaweeds, coins, tokens, &c.—F. Stanley, 6 Clifton Gardens, Margate.

I HAVE clutches of about 100 species of American eggs to exchange, also many British. Wanted, a clutch of each of following: stonechat, blackcap, goldcrest, nuthatch, twite, crested tit, jay, raven, hobby, tawny owl, heron, ruff, dunlin, woodcock, and many others. Please send lists to W. Wells Bladen, Stone, Staffordshire.

BOOKS, ETC., RECEIVED.

"Text-book of Entomology," by W. F. Kirby (Sonnenschein).—"Physical Expression," Dr. F. Warner (Kegan Paul, Trench & Co.).—"The Moon and the Weather," Walter L. Browne (Bailliere, Tindal & Cox).—"The Canadian Entomologist."—"The Botanical Gazette."—"Ben Brierley's Journal."—"Illustrated Science Monthly."—Cole's "Studies in Microscopical Science." 4 parts.—"Revista Scientifica," Porto.—"32nd Annual Report of Nottingham Naturalists' Society."—"Journal of the New York Microscopical Society." —"Science."—"Proceedings of the Academy of Natural Science of Philadelphia."—"Le Monde de la Science."— "On Child Culture," Dr. T. M. Madden.—"American Monthly Microscopical Journal."—"Midland Naturalist."— "Feuille des Jeunes Naturalistes."—"The Homing Pigeon."— "The Naturalist."—"Journal of the Quekett Microscopical Club."—"The American Naturalist."—"Notes on Books Published by Longman & Co."—"Report of the East Kent Natural History Society."—"The Denudation of the Two Americas," by T. Mellard Reade.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:— G. F. H.—J. C. P.—W. F.—R. W. G.—J. E. R. G.—A. S.— A. N. T.—J. F.—J. H. L.—A. C. S.—R. M.—R. R.—G. C. —C. A. S.—H. G. G.—J. C. B.—A. D.—M. H. R.—C.—J. P. —W. B. W.—A. S. P.—J. H. G.—A. W.—W. H. H.— W. R. N.—C. P.—R. L. H.—W. B.—T. C. A.—H. M.— C. T. M.—W. W.—J. T. T. R.—H. D.—E.—B. P.—J. W. W. —H. W. L.—A. O.—J. A. W.—W. G.—G. B.—J. W. T.— J. M. H.—F. M.—E.—T. F. U.—G. W.—W. J. S.—F. M.— T. E. A.—F. A. A. S.—A. F.—W. J.—T. B. B.—J. J. A.— D. O.—W. S. W.—M. E. T.—W. M. W.—W. W. & S.— W. T.—C. D.—R. G. M.—A. S. M.—W. E. C.—F. S.— J. L. M.—X.—C. R.—M. A. O.—B. H. W.—W.—A. D. W. —W. H.—H.—J. R. M.—J. R. M.—J. A.—S. J. T.— W. S. A.—W. W. B.—A. D.—S. C. C.—A. A.—A. J. H.— J. J. A.—W. J. S.—J. F. C.—R. E.—H. F.—A. C. S.— H. Q., &c., &c.

F T L del. ad nat. Vincent Brooks Day & Son, Lith

SMALL BRITTLE STAR-FISH.
× 35

GRAPHIC MICROSCOPY.

By E. T. DRAPER.

No. XX.—Small Brittle Star-fish.

THE illustration represents the ventral surface of the disk of *Ophiocoma neglecta* (the small, or grey brittle star-fish) of the family Ophiuridæ, and also exhibits the attachments of the five long spinous radiating arms; the object is sufficiently minute to require, for the exposition of its beauty and symmetrical structure, a magnification of thirty or more diameters. Specimens in age, and development, necessarily vary in size, but in this particular species, the average diameter of the disk is about one-sixth of an inch, and the rays, or radiating arms, are of such disproportionate length, as to maintain and justify the term Ophiuridæ (serpent tailed); these elongated arms, unlike those of the true star-fishes, have no ambulacral tentacles, or processes.

In Ophiocoma the length and extraordinary flexibility and adhesive power of the arms are aided by smaller spinous processes, affording the capability of very active powers of locomotion and prehension; this characteristic is peculiar to the species; having no perfect sucker tubes, aiding deliberate progression, as seen in the Echini, and true star-fishes, they curiously exhibit far greater activity, the jointed arms possessing a quivering, jerky movement; undeveloped membranous tentacles are indicated, but never reaching the steady crawling capability of similar organs, found in other Echinoderms.

Generic character depends on configuration of the rays (always five), and on the form and specific distinctions disclosed in the arrangement of the many plates and scales.

Under magnification, disks of the Ophiocomæ reveal great elegance; from a point in the centre of the dorsal side, opposite to the position seen in the illustration, is a series of radiating imbricated scales of uniform size, overlapping each other, turning over the circumference of the disk, and eventually reaching the quinary plates, forming the mouth and bases of the rays; the surfaces of all the parts appear smooth, but under high magnification disclose areolar markings. The central disk is beautifully patterned, and the various pieces, with care, are capable of separation. The mouth is in the centre, leading by a short gullet to a digestive sac; this one aperture serves for the reception of food, and the expulsion of unabsorbed portions, the aliment consisting of decayed animal substances. In a living condition, surrounding the borders of the mouth, are seen a series of very minute tentaculæ, as it is known these apparently helpless creatures are notoriously ravenous. It might be assumed that, beyond the power of ingurgitation, they possessed some enablement of mastication, or at least prehension; this may be detected! If one of the five pieces, involving the aperture of the mouth, be laid open, and the under surface examined with a high power, it will be found beset with minute sharp pointed recurved spines, which, if not teeth, evidently have a file-like clutching action; a perfect disk arranged with one of these quincunx parts folded back, is a striking microscopical exhibit, showing the points referred to, also the cavity of the stomach beneath.

The rays, or arms, in proportion to the disk, are comparatively long, excessively friable and brittle in the living condition, falling to pieces under the slightest shock, or even touch, rendering it somewhat difficult to capture perfect specimens. These fragile calcareous rays are necessarily permeated by organs of motion, secretion, and sensation; externally appearing like curved-rounded conical boxes, fitting into each other, each plate or cup edged with

spines. In another variety, *O. rosula*, the minute spikes under well-adjusted conditions of magnification and illumination are objects of extreme elegance; composed of a hard brittle substance of brilliant transparency. These glassy structures are observed in great perfection and variety of form throughout the entire class of Echinoderms, and known as Pedicellariæ, arming the tips of the tubular feet of the true star-fishes and Echini, fulfilling in some instances the functions of grappling irons; or as spicules as found in the genera Holothuria, Synapta, Chirodota, imbedded in the tissues in the form of perforated plates, circular disks, spikes, and curved points, aiding in every instance some supporting or locomotive power; but under whatever conditions these glassy structures are placed, they invariably retain a peculiar grace of configuration, and a typical principle of uniformity.

In securing living Ophiuridæ, the greatest precaution is necessary, as under the slightest interference, they immediately shatter themselves into fragments, leaving only the central disk. Sudden death by immersion in fresh water will secure them intact. Dead and desiccated specimens, with the rays attached may be found on some coasts in drift sand, but their beauty is always impaired by abrasion.

Professor Edward Forbes, in his delightful "History of British Star Fishes," refers to the precautions necessary to obviate the suicidal and dislocating propensity of the brittle star-fish, and how to capture it in its entirety. He gives, in his learned and amusing volume, a graphic and ludicrous description (often quoted) of one of his particular failures; curiously enough, the rich humour of this passage was incorporated *au sérieux* by a learned German naturalist, in his work on the same subject.

Crouch End.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

An interesting experiment has been made, and is now in progress as a practically successful process, in disposing of the sewage of Buxton (Derbyshire), 100,000 gallons of which have to find their way in some condition to the Wye, a little river which in dry weather becomes a half-and-half mixture when the sewage is added to it. The necessity for a remedy was of course urgent; many schemes were tried and abandoned, until the idea of mixing the sewage with a natural chalybeate water flowing from a disused colliery was carried out. The water contains sulphate of iron, magnesia, alumina, lime, and soda, besides some carbonate of iron and silica. The chalybeate water added alone partially purified the sewage, but by adding lime to it before mixing with the sewage the purification was effectual to the extent of producing a clear effluent from which $\frac{6}{7}$ of the original organic ammonia was removed, and $\frac{3}{4}$ of the free ammonia. The chemical details, which are very interesting, but too much for quotation here, will be found in a paper read at the Society of Arts, by Dr. Thresh, and published with report of discussion upon it in the Society's Journal of May 22.

The total cost of thus dealing with the sewage is £275 per annum, covered by a rate of 1$\frac{3}{4}$*d.* in the £. If the precipitated sludge is rendered marketable for manure, as it should be, this may be reduced considerably. The chalybeate water was previously a nuisance, owing to its ochreous deposit in the river. The two nuisances now neutralise each other; and the condition of the river is actually improved by the sewage and lime. Twelve grains of slaked lime to the gallon of mixture is the mean quantity added.

At the meeting of the Chemical Society, June 18, Mr. R. J. Friswell stated the results of eleven months' laboratory experience with toughened glass beakers, made according to De la Bastie's patents. They were by no means satisfactory.

Of twenty beakers two burst spontaneously; one, when hot water was poured into it; six became useless from fissures and exfoliation; three were broken by unknown means, and eight remained in good condition. They were supposed to bear heating over the flame of a rose burner while supported on wire gauze, as the best Bohemian beakers do, but one having burst when hot water was poured into it this severe test was not applied.

The fissures and exfoliation were curious, the fissures "so close together and running so completely over the surface of the beaker that it had the appearance of being covered with a tissue of spider's web." Mr. Friswell's conclusion is that "taking into consideration the loss of confidence caused by the high percentage of spontaneous bursting, it may be said that toughened glass is a complete failure in the laboratory."

The cutting of bottles and glass tubes is a laboratory operation of much economic utility and some difficulty. Small tubes are easily and quickly cut by simply notching with a triangular ("three square") file and applying a binding strain combined with a pull, but when the tube is large this method fails. There is another method described in some books, that of passing a piece of string round the tube, soaking the string in alcohol or turpentine, and then lighting it. According to the aforesaid books this is very easy, but those of my readers who have tried it know better. A modification is now proposed which appears to be really effectual. A fine iron or platinum wire is wound round the tube, a current of electricity is passed through this, making it red hot or nearly so; then it is cooled with water, and the heat being purely local, not outspread as by the flaming string, a clean cut is made. My own experience suggests an improvement on this, viz. to

make notches with a "three square" file on opposite sides of the glass where the cut is required. These direct the wire and give a start, besides preventing sideward cracking; I have thus succeeded with the string.

Professor Langley's lecture on sunlight and the earth's atmosphere, delivered at the Royal Institution, is very interesting, as it contains a summary of his researches on Mount Whitney, where he attained a sufficient elevation to leave nearly half of the atmosphere below him, and thus was able, with the aid of instruments of especial delicacy, to compare the solar radiations received up there with those which we ordinarily receive down here at the bottom of the atmospheric ocean. One of his broadest results is the conclusion, that "the total loss by absorption from atmosphere is nearly double what has been heretofore supposed." Therefore the sum total of the solar energy must be proportionally greater than the usual estimate. He sets it down as capable of melting a shell of ice sixty yards thick annually over the whole earth, or "of exerting over one horse power for each square yard of the normally exposed surface."

There is one inference stated in the report of the lecture which puzzles me, viz., that "if the planet were allowed to radiate freely into space without any protecting veil, its sunlit surface would probably fall, even in the tropics, below the temperature of freezing mercury."

In this there is a physical fallacy which I would fain believe it impossible for Professor Langley to perpetrate. In the case supposed there are two bodies, the sun and the planet, opposite each other, mutually radiating and receiving radiations.

According to the well-established "law of exchanges," when bodies are thus exposed to each other and their temperatures are unequal, "the hotter bodies will emit more radiations than they receive from the colder bodies, and therefore, on the whole, heat will be lost by the hotter and gained by the colder till thermal equilibrium is attained." (J. Clerk Maxwell.) This assumes that between the bodies there is no absorbing medium, i.e. free space.

It is clearly evident that under these circumstances the cooler body, i.e. the planet (or say the moon, which is an unprotected planet with one side thus exposed), must be radiating less heat than it is receiving and therefore becoming warmer, and that the temperature of "its sunlit surface" must be greater without the protecting veil than with it. This conclusion is easily confirmed by experiment. A black bulbed thermometer rises higher and higher when exposed to direct solar radiations at greater and greater elevations in a given latitude. Water may be boiled on the snow fields of the higher Alps, by simply placing it in a blackened copper vessel in a blackened box with glass cover, and freely exposing it to the solar radiations.

My conclusion is that Professor Langley did not mean what the reported words express. His meaning must have been, not that its actually sunlit surface would thus fall, but that a surface which *had been* sunlit, and is now dark, would fall; not that the bright side of the moon would fall below the freezing-point of mercury, but that the dark side, or the side that *had been* bright, would radiate away its heat as rapidly as it received it. I have discussed this thus fully, finding that Langley has been credited with having proved, by his experiments, that the bright surface of the full moon, in spite of the direct solar glare, is colder than freezing water.

His experiments show, that all our estimates of the temperature of the lunar surface, based on comparison with that of the earth, must be raised in proportion to his correction of the amount of *our* loss by atmospheric absorption.

Our pre-eminence as "the land of tin" is becoming seriously disputed. Cassiterite containing 94·895 per cent. of tin oxide is now found at Irish Creek, Rockbridge County, Virginia, in loose crystals, as fragments on the surface, and in veins. The veins occur in a coarse grained, much decomposed, granite or gneiss. Besides the tin oxide, it contains 3·418 per cent. of sesquioxide of iron, 0·760 of silica, 0·244 of lime, 0·27 of magnesia, and 0·237 of tungsten. If the commercial quantities correspond with its chemical richness, this mineral will exert a considerable influence on the metallurgical industry of the United States.

W. Hempel has made some experiments on the combination of the different forms of carbon with iron, with results that must be very disgusting to certain superlatively practical people. Different parts of the same piece of iron foil were equally exposed at a high temperature to carbon in the form of diamond dust, to graphite, and burnt sugar carbon. The diamond dust did the work of converting the iron into steel, while the graphite and amorphous carbon were ineffectual. The heat was continued for two hours. Ordinary cementation occupies about two weeks. Other experiments have shown that carbon, in the form of diamond, combines with iron at a lower temperature than either of the other forms of carbon.

Within the reach of my own recollection, as a teacher of chemistry, the silvering of glass by precipitation of actual silver was merely a laboratory or lecture-table experiment. Now it is extensively used for the practical manufacture of mirrors on a large scale, superseding the old amalgam of mercury and tin foil. It has done good service to the astronomer by supplying him with "silver-on-glass" mirrors for reflecting telescopes, which are now so extensively superseding the more costly and ponderous speculum metal. Böttger, in a recent paper, recommends the following proportions of materials to be used. Dissolve four parts of pulverised nitrate of silver in strong ammonia. Then add to this one

part of ammonium sulphate, and 350 parts of distilled water to form the silver solution. The reducing solution to be made of 1·2 parts of starch or grape sugar, with three of caustic potash dissolved in 350 parts of distilled water (these parts all by weight). When used, equal parts of the liquid are mixed together and applied to the substance to be coated with silver.

Our vegetarian friends who encounter the objection to their system, that we shall be deprived of leather if they prevail, may be gratified to learn that in the last volume of the Chemical "Centralblatt," p. 798, is a paper on vegetable leather, by M. Bauer, L. Brouard, and J. Ancel, who join in stating that the following forms a very good substitute for leather: 6 lbs. 10 oz. of gutta percha, 2 lbs. sulphur, $2\frac{1}{4}$ lbs. raw cotton, $1\frac{1}{4}$ lb. of zinc-white, $3\frac{1}{2}$ oz. colcothar, and 9 ounces of antimonic oxide. These are to be vulcanised by steam. The essential constituents are the gutta percha and sulphur; the others may be varied and replaced, according to the character of the leather required. This "vegetable leather" is therefore a vulcanized gutta percha hardened by the zinc, and toughened by the cotton.

Good work is being done at the summit of the British Isles. The Ben Nevis Observatory is in full operation, winter and summer. The observers have a remarkably quiet life during the winter, but are now threatened with tourist invasion in summer time, as the building of a hotel is contemplated. Whether a climbing railway, like that on the Righi, will be added, remains to be seen. Mr. Buchan has already worked very effectively on the following problems: 1st, the normal or average temperature and barometric pressure for each month, and the normal differences between these averages and those at sea level; 2nd, the daily variation of temperature and pressure during each month; 3rd, the daily variation in the average velocity of the wind; 4th, variations of the wind as regards their general prevalence over Scotland; 5th, hygrometric observations, and observations of rainfall, and depth of snow, &c.

There are higher observatories in other countries, but the isolated position of Ben Nevis, and its clear uprise directly from the sea, afford special facilities for some of the most interesting observations. Its geographical position, in reference to the Gulf Stream and polar atmospheric currents, also adds to the interest and value of the observations. Present space does not permit me to go into the results of these observations, but I hope to return to the subject hereafter.

A very useful paper on the so-called "Wingless Birds," fossil and recent, with a few words on birds as a class, by Dr. H. Woodward, F.R.S., may be found in the "Geological Magazine" for last month.

PARASITICAL FLOWERING PLANTS.

By A. D. Webster.

[*Continued from p.* 159.]

THE dodders, of which there are three recognised species, *Cuscuta Europæa*, *C. epilinum*, and *C. epithymum*, twine themselves around the stem and branches of other plants, and become attached to them by means of minute tubercles or suckers, and thus attract from the system of the plant and air the sustenance necessary for their own support. They possess the double power of germinating either in the capsule or the earth; in the latter case they adhere to the ground by the original root, drawing nourishment therefrom until the young stem has fixed itself to another plant, after which the original root withers away.

The dodders spread with terrible rapidity, and are often a source of annoyance to husbandmen, especially in the cultivation of leguminous crops. They destroy the plants, either by depriving them of their nourishment or by strangling them in their folds.

The greater dodder (*C. Europæa*) is generally to be met with along the sides of hedges, and in neglected ground, growing on brambles, nettles, and grass; also on flax, hemp, and clover. It is an annual parasitical plant, with twining, thread-like stems of a purplish-red colour, usually attaining a height of two or three feet. The stem is much branched and destitute of leaves, except here and there a small membranous scale immediately under the branches. The flowers, which are bell-shaped or globose, grow in dense round clusters, of from ten to twenty in each, are sessile, and of a whitish appearance with a slight pinkish tinge. Rarely more than half-a-dozen of the flowers are open at the same time, the lower ones being not half developed when the upper are in full bloom.

Although said to be rarely found in Wales, this is not the case, as I have frequently met with it and more than once in large quantities. The plant being of diminutive size and certainly not well known, may account for the few districts from which it has been recorded. On a farm near here, several fields of clover last season suffered very severely from the dodder, large patches here and there being quite killed down by its encroachments. In walking over the fields the dodder is readily recognised, from the pinky appearance it gives to the half-withered clover that is gradually becoming strangled in its deadly embrace. The leaves of the clover on which the plant is living first become covered with small black spots or patches, gradually turn unhealthy, and ultimately die back to the ground. The roots of the clover do not appear to be injured.

After examining the neighbouring plantations, fences, and hedges, I came to the conclusion, that in this case the dodder seeds were imported with those of the clover, which, if correct, should make

seedsmen very careful before disseminating the germs of such a troublesome and ruinous plant. Strange to say, all the fields just referred to were sown with clover seeds obtained at the same time and from the same source.

The lesser dodder (*C. epithymum*) grows on thyme, heath, and other small shrubby plants, and is of much finer growth than the latter species, though in other respects the two plants are much alike. The stems are usually of a deeper red than those of the greater dodder, and generally more twisted or entangled; indeed it is no easy task to follow one of the stems from base to tip, so intricately twisted do they become. As well as the plants mentioned above, the lesser dodder has been found somewhat plentiful on clover, gorse, &c.

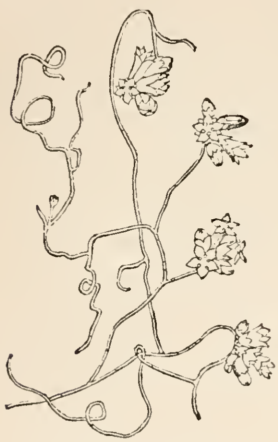

Fig. 113.—Dodder (*Cuscuta epithymum*).

Fig. 114.—Toothwort (*Lathræa squamaria*).

The flax dodder (*C. epilinum*) is almost exclusively confined to the plant from which the popular name is derived, and is generally supposed to have been introduced into this country with the cultivation of flax.

In the island of Anglesea this plant was, a few years ago, pretty abundant amongst a crop of flax. I have, however, not heard of it since. The differences between this plant and the greater dodder lie chiefly in the flowers, which are fewer in number and somewhat larger.

The toothwort (*Lathræa squamaria*), in singularity of habit and general construction, very nearly approaches the orobanche. It is, however, distinguished by several well-marked technicalities, especially in the construction of flowers and formation of the root, both of which differ considerably from those of the orobanche. It is a diminutive plant, always or usually less than a foot in height, and covered with numerous white fleshy scales instead of leaves. The root-stock is of a dirty white colour, and composed of numerous short, fleshy, imbricating scales. Flowering stem naked, or with sometimes one or two oval scales which gradually pass into the bracts. The flowers, which are numerous, and arranged in a somewhat one-sided spike, are of a pale purple, streaked, and marked with light blue and red, but as they soon fade these colours cannot be relied upon as constant; so that the plant at various stages of growth, and according to the locality in which it is found, presents a diversity of features by no means easily described. Sometimes the flowers appear of a greenish colour to the casual observer, but on closer examination faint tracts of other colours are readily detected.

It grows on the roots of various trees, as the hazel, laurel, and elm, and is generally found in the most hidden recesses of dry woods, which may partly account for its pallid, unhealthy-looking appearance. It is not an uncommon

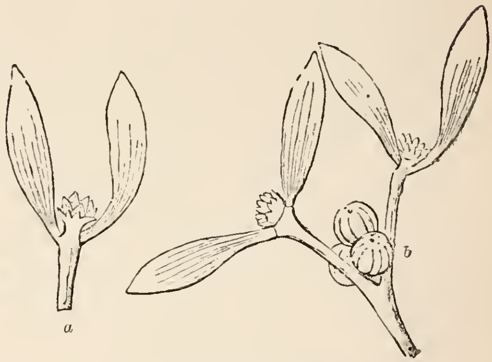

Fig. 115.—Mistletoe (*Viscum album*). *a*, flower; *b*, fruit.

plant, having been found in many English counties, as well as, though in limited quantity, in Ireland and Scotland.

The mistletoe (*Viscum album*) is the largest and most aspiring of our native parasites, and is by many considered as the only true parasitical plant indigenous to Britain, as at no time does it receive any nourishment from the soil like a few other members of this family; but although the dodders do not actually, like the mistletoe, plunge their roots into the wood and incorporate themselves with the tissue, still the fact of their living on and deriving nourishment from other plants will be sufficient reason for including them in this class.

This is an evergreen bush from two feet to sometimes as much as five feet in diameter, with dichotomous shoots, and pairs of light green leaves. It is diœcious, having the sexes separate on different

plants. It flowers in spring, and is usually covered during the winter with small, white, glutinous berries, not unlike tiny pearls. In some situations the mistletoe is rather difficult to propagate, which is most readily performed by inserting the bruised berries into crevices, or even rubbing them on the smooth surface of the bark in spring—the glutinous matter of the fruit aiding in attaching it—and tying a piece of matting or other material over as a preservative against birds and insects, both of which are dread enemies to the young plant. The mistletoe may also be grafted by inserting, early in May, a scion with a bud and leaf into an incision made in the bark of such tree as it is intended to grow upon. The seed is not long in germinating; the radicle penetrating into one of the numerous chinks of the bark settles between the wood and bark of the sustaining tree, and finally insinuating its fibres into the woody substance soon becomes one with its foster parent, deriving the ready-made nourishment therefrom necessary for its own support. The seeds are triangular in shape, and at two of the angles put forth shoots very nearly resembling the horns of a snail.

Occasionally both horns take root and form two distinct plants, supposed by some to be male and female, but of this latter I cannot speak with any amount of certainty. After collecting information from various sources, the following is a list of the trees on which the mistletoe has been found, the addresses of recorders being now in my possession: apple, pear, whitethorn, oak, elm, willow, maple, poplar, lime, service, hazel, horse-chestnut, acacia, mountain ash, laburnum, white broom, laurel, locust-tree, crab-tree, birch, sycamore, medlar, lime, service, white beam, alder, hornbeam, larch, and, according to a correspondent of "The Garden," abundantly on the Scotch fir between Munich and Innspruck, in the Bavarian Tyrol.

The late Mr. Bentham, in his last edition of the "British Flora," says that mistletoe is not known in Scotland or Ireland. This is, however, surely a mistake, as in an orchard rented by my father on Sir William Verner's estate in the North of Ireland, I have frequently seen the mistletoe growing on the apple-trees; and in Scotland, according to Mr. Henry Evershed, it grows on the north side of Kinnoul Hill, near Perth, and in the nurseries of Mr. Morrison at Elgin, and at Gordon Castle in Morayshire.

I believe, however, although I am at present unable to state positively, that neither in Scotland nor Ireland has the mistletoe been found growing on the oak.

The mistletoe is perhaps more frequently associated with the oak than any other tree, but it is well known that the plant is rarely found on the oak; how rarely the following list of mistletoe oaks in England and Wales will show:

(1) At Clarendon Park, Salisbury, Wilts; (2) two miles from Cheltenham; (3) at Llindridge, Worcestershire; (4) at Lord Lowndes' Park, Lees Court, Kent; (5) at Knightrick Church, Worcestershire; (6) at Hendre, Llangattoch, Lingoed, Monmouth; (7) at Budwardine, Herefordshire; (8) at Haven, in the ancient forest of Durford, Hereford; (9) at Frampton Severn, Gloucestershire; (10) not far from Plymouth (by the side of the South Devon Railway); (11) at Hackwood Park, Basingstoke, Hants; (12) at Badham's Court, Sunbury Park, near Chepstow; (13) at Ledstone, Delamere; (14) at Eastnor, Hereford; (15) at Burningford Farm, Dunsford, Surrey; (16) in an old forest in Carmarthenshire.

The above may be considered as a pretty accurate summary of the mistletoe oaks in England, but I shall be very pleased to hear from any one who can further extend the list. Miss Owen, of Knockmullen, writes me to say that her friend Mr. O. Donnavan found the mistletoe growing on several oaks, and at least one fir-tree, in the remains of an old forest that extends here and there along the courses of both the Towy and Cotti rivers in Carmarthenshire.

I have now come to the conclusion, that there is no tree on which the mistletoe will not grow, and that its scarcity on any tree is not owing to any dislike on the part of the mistletoe, and I believe that further research will only tend to confirm my statement.

Of the Druidical and superstitious uses of this plant some curious particulars are related by Pliny in his "Natural History," where we learn that it was ordained to be cut with a golden sickle, and only by the priest, clothed in white, and the plant received in a white cassock at all times before the moon was six days old (literally translated). It is a curious fact that in the favourite Mona of the Druids—Anglesea, that greatest seat of Druidical superstition—there is not, according to the Rev. Hugh Davies, a single specimen of the mistletoe oak, although of cromlechs, carnedds, and other Druidical remains, many still exist, not a few being in a good state of preservation.

THE AGE OF THE MALVERN HILLS.

By J. Walter Gregory.

[*Continued from p. 126.*]

HAVING thus discussed the evidence on which the new interpretation is mainly erected, let us briefly glance at that on which the old theory stands.

The leading points are Firstly: it is in thorough accordance with the general structure of the hills, the chloritic and micaceous schists, which are particularly well exhibited at Wind's Point, becoming more gneissoid and less schistose as they approach the syenitic nucleus, and gradually passing into masses with the lines of bedding quite obliterated.

Secondly: the strike of the igneous rock is parallel to the flanking Cambrian deposits, differing most distinctly from the discordant relations of the gneiss and newer rocks in the North-West of Scotland, and entirely agreeing with the parallelism of the Cambrian and Silurian strata in North Wales. On this Murchison lays great stress.*

Thirdly, the absence of the Lower Cambrian rocks which attain such an enormous development within a comparatively short distance to the north; and their absence is all the more extraordinary, when we remember that Longmynd rocks occur only nine miles south of the Malvern Hills on a direct line with the great fault that has brought both to the surface. This inlier, which for many years has been a great thorn in the side of the Archeanists, is a small boss of hard silicious schistose rock with many quartzose veins. That it is really a member of the Longmynd series, is supported by an overwhelming weight both of evidence and opinion: in 1879, during the excursion of the Geologists' Association, this rock was visited under the guidance of Dr. Callaway and Dr. Hicks, who state in their report,† that those members acquainted with the Longmynd in other areas acknowledged its close resemblance to those rocks, both in mineral character and state of induration. Since this date Dr. Callaway has, to use a recent political phrase, "chucked up the sponge," and abandoning the attempt, made in the report quoted, to explain away this knoll of rock, has confessed ‡ that it is Longmynd. This admission is of the greatest value, as we can easily see how the movements that intruded the syenite into and altered the Longmynd rocks at Malvern, should have brought up on the same great line of fault, crumbled and contorted, a fragment of the same rock, which on any other theory is inexplicable.

But some readers may impatiently ask, What on earth does it matter whether these Malvern rocks are Pre-Cambrian or Cambrian? And whether, as the difference is so slight, discussing so apparently trivial a point at such detail is not the mere affectation of specialists? To such the answer is simple. If one were to debate whether a bed was Triassic or Liassic, it would be a mere matter of classification, of which most naturalists would know nothing, and for which they would care less. But this is no mere question of nomenclature: a great fundamental point is at issue, and on the conclusion at which we arrive, depends the interpretation of the whole record of the world's history in Pre-Cambrian times. Should we accept the Archean teaching, we must abandon those old views of the absolute uniformity of nature, which Lyell made the foundation stone of much of the geology of the last forty years. We shall return to the petrological creed that Werner taught a century ago, and believe that gneiss and schists were deposited by chemical precipitation in some boiling ocean "when the earth was young," and must hold that just before the Cambrian era some great change, for which we know no reason, and of which we have no satisfactory evidence, passed over the earth. These are but some of the cloud of intricate and complicated problems, that we raise or allay, as we decide one way or the other, and a complete revolution of our petrological ideas hangs in the balance.

It is from no desire of rushing into a great controversy, regardless of the difficulties in the generally received interpretation, or of the great names arrayed in the ranks of the new school, that I venture to submit these few notes, but, that the views advanced by Mr. Watts should not, by being unchallenged, appear to be endorsed; and that the conclusions arrived at by men, whose lives having been devoted to geological mapping had attained an experience and skill still unrivalled, should not be lightly cast aside; and in the hope that fellow students of geology may be induced to pause before adopting a theory, however plausible and pretty it may appear, or however ably and persistently it may be advocated, without the most careful consideration of both sides of this complicated and interesting subject, and of the momentous issues involved in the discussion.

* It is of course possible to point out isolated instances in which this is not the case, but as a general rule the strikes are parallel.

† "Proc. Geol. Assoc." 1879, vol. vi. part 5.

‡ "Quart. Journ. Geol. Soc." vol. xxxvi. p. 537.

NOTES ON NEW BOOKS.

Birds I have kept in Years gone by, by W. T. Greene, M.A., M.D., F.Z.S., &c. (London: L. Upcott Gill). Dr. Greene has evidently a kindly feeling for his pets, and discourses in a pleasant style on their habits and the best ways of keeping them, including frequent directions for dieting and medicine. His list of birds is a long one, containing both British and foreign, and his book is illustrated with coloured plates, and provided with a table of contents. It may be a question in the case of some birds, whether their lot is happier or not in captivity than in freedom. On the one hand they suffer the loss of liberty, and are liable to disorders due to an unnatural diet, bad housing or other mismanagement, but on the other hand they are protected from the contingencies of an outdoor life, and are generally sheltered from the attacks of their natural enemies. Anyhow, if birds are to be kept in captivity, they are not likely to fall into more experienced hands than those of Dr. Greene, and perhaps some of the pity might be better expended if bestowed on the captives before they come into such keeping as his.

The Birds of Lancashire, by F. S. Mitchell (London: Van Voorst). This book is an example of that Saxon energy which enables a man, though engaged in business, to find time to devote attention

to natural objects, a feature of character which is by no means unknown in Lancashire. Mr. Mitchell's book is an account of the birds occurring in the county, about which he gives notes of the observations of others and his own, and many local names, and other interesting information. By text and illustration he shews, also, how the birds fall victims to the deceitful ways of men.

Elementary Text-book of Entomology, by W. F. Kirby (London: Sonnenschein & Co.). This is a handsome book, illustrated by 87 plates which contain a large number of uncoloured figures. The table of contents, showing a tabulated list of the families, grouped under seven orders, is followed by an introduction of about a dozen pages, giving a brief account of insects in general, their zoological position, structure, physiology, occurrence, &c., and lastly their classification. Then follows the main body of the work, over 200 pp., in which the families are taken in succession and described. Last of all come the plates. It is a pity that so good a book as this appears to be, and which even as it is may be of great use, should have its usefulness diminished by the absence of alphabetical indexes of scientific and popular names. As it is, if a student wishes to see, for example, what is said about ladybirds, he is at a loss to do so if he does not know to what family they belong, and if he succeeds he cannot then tell from the text whether a figure is given or not in the plates. But, in spite of this drawback, the book can be made of great service. The butterflies and moths treated of are mostly of foreign species.

Physical Expression, its Modes and Principles, by Francis Warner, M.D. (London: Kegan Paul, Trench & Co.), 5*s*. This book is not everybody's reading. It gives detailed observations of various modes of expression, as shewn by movements and postures, by the head, face and eyes, and by the attitudes of the hands. The physiology of expression is noticed, and reference made to Dr. Ferrier's vivisectional experiments on the brains of monkeys and dogs; while among the illustrations are some shewing apparatus for obtaining graphic records of limb-movements. Perhaps it is the condensed style in which the author has written which makes his book rather hard to follow, and allows the attention readily to wander for want of more expanded illustration.

Walks in Epping Forest, edited by Percy Lindley (London: 123–5 Fleet Street), 6*d*. This little book is published in a form convenient for the pocket in stiff paper boards. Its object is to afford a guide to ramblers in the forest, and with this view, after a short and pleasantly-written introduction, comes a sketch of the History of the Forest, and then one of the Geology (by Mr. H. B. Woodward, F.G.S.); followed by "The Forest as it is"; Cycling routes (by J. Wilson); an Account of Chingford, walking routes in or near the Forest, and the Fauna and Flora of the Forest, &c., most of these articles being contributed by A. H. Wall or the Editor. At the beginning a folding map, at the end contents and an index; and as if all this were not enough for the price, numerous illustrations are given of views in the forest or neighbourhood, some of which form attractive pictures. A visit to Epping Forest is to the writer of this notice still an unknown experience, but he hardly expects to have a handier and more entertaining guide, for such a visit, than this of Mr. Lindley's.

The Metaphysical Aspect of Natural History, by Stephen Monckton, M.D. (London: H. K. Lewis). This is a well-printed little book of over forty pages, and consists of an Address delivered to the Rochester Natural History Society, the object of the author being to show that a student may advance from a sure point, by sure steps, drawing only on the resources of scientific observation and admitted history, to the conclusion that there is in nature an intelligent will-force, which is also the Author and subject of the Bible. The familiar figure given of the Paper Nautilus is apt to perpetuate the old idea, that it hoists its "sails" to the wind.

The Moon and the Weather. The Probability of Lunar Influence Reconsidered, by Walter L. Browne (London: Baillière, Tindall, & Cox). 3*s*. The influence of the moon upon the weather is once more brought under discussion in Mr. Browne's book. "The proof of the pudding is in the eating," or, to use the phrase Mr. Browne adopts: "Prevision is the test of true theory," and he boldly prints at the end of his book a list of predictions of depression areas for last April, May, and June, on behalf of which he suggests comparison with published weather-maps. The book was received when about half that time had elapsed, and readers have in this list the opportunity afforded them of judging of Mr. Browne's success in predicting storms.

The Microscope in Botany;—a Guide for the Microscopical Investigation of Vegetable Substances. From the German of Dr. J. W. Behrens, translated and edited by Rev. A. B. Hervey; Dr. R. H. Ward assisting (Boston: S. E. Cassino & Co.), price 5 dols. This will prove, to all appearance, a very useful book. It consists of about 450 pp., clearly printed on good paper, and furnished with contents and index, it deals with microscopes, microscopical accessories, preparation of microscopic objects, microscopical reagents, and microscopical investigation of vegetable substances. References to makers of particular pieces of apparatus are for the most part American, being the work of one of the editors, the matter introduced by them being placed in brackets. Microscopic drawing and measurements receive attention, as also the preparation of objects, section-cutting, mounting, turn-tables, labelling, &c., detailed directions being given. The fifth and last chapter is devoted to the microscopical examination of vegetable substances,

including cellulose, starch, protoplasm, &c., and the spectroscopic behaviour of chlorophyll. A notable feature in this chapter is the list of references to the literature of the various subjects given under their respective heads. Scattered throughout the work are numerous good woodcuts, and at the beginning two plates of test objects. The book is decidedly one to be recommended.

Year-Book of the Scientific and Learned Societies of Great Britain and Ireland (London: Charles Griffin & Co.). This is the second annual issue, and, to quote from the preface, it aims at affording: (1) An Account of Scientific Work done in the various departments throughout the year; (2) A Record of Progress; and (3) A convenient Handbook of Reference. With this view, it gives first a list of Societies devoted to Science generally, including Literature, from the Royal Society, downwards. In most cases the names of officers are given, and in many cases lists of papers read. This part extends over more than fifty pages, or about a quarter of the whole book, and is followed by the special societies arranged under their subjects, and treated in the same way. There is a good index, and the Annual will doubtless be found a useful book of reference.

Celestial Motions: a Handy Book of Astronomy, by W. T. Lynn, B.A., F.R.A.S. (London: Stanford). This handy little book is now in its third edition. It consists of about eighty pages pretty well packed with information about the earth, moon, sun, planets large and small—a numbered list of the latter being given, now amounting to nearly 250, with names of discoverers, and date and place of discovery, —comets, meteoroids, and fixed stars. The last chapter consists of a short historical sketch of astronomical discovery, and is followed by a brief glossary of terms used. It appears to be a very useful book to keep on hand, for reference as to the elementary facts of astronomy.

THE "Geological Magazine" for May contains a somewhat long review, with figures, of Professor Marsh's monograph of the Dinocerata.

SOME FERNS OF HONG KONG.

By MRS. E. L. O'MALLEY.

[*Continued from p. 150.*]

Gen. X. ASPIDIUM, Sw.

(*Shield-wort or Buckler-fern.*)

SO called from the indusium fastened either in the centre, or on one side (like a shield or buckler), and covering the sorus, or seed-heap.

Nephrolepis, Presl, or kidney-shaped buckler-fern, is a section of the genus in which the indusium is very deeply indented on one side.

Fig. 116.—*Nephrolepis tuberosa* (Presl).

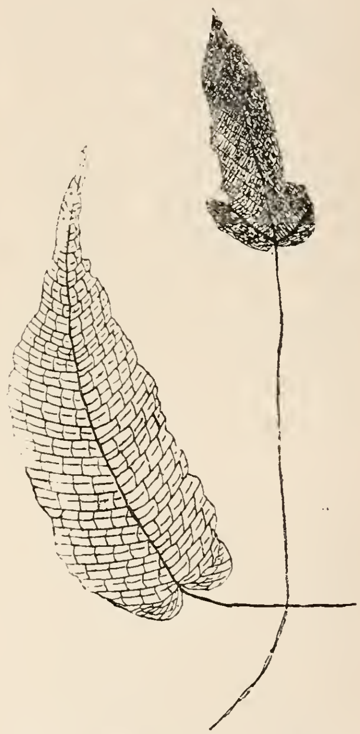

Fig. 117.—*Meniscium simplex* (Hook.).

N. tuberosa, Presl, is exceedingly abundant, and is soon recognised by the short, stiff, erect pinnæ, growing closely together up each side of the stalk, and round the inside edge of which are the kidney-shaped sori, and outside a row of white chalky-looking dots. This species has tubers at the root. It is also found in another form, and without tubers, and the pinnæ much longer and more straggling.

In *N. acuta*, Presl, the frond reminds us of Brainea, for the pinnæ are long, smooth, and not at all crowded. The leaf is a bright glossy green, slightly wavy at the edges, and grows to a considerable size. In Glenealy it is abundant, and adds much to the

beauty of that romantic spot. Two of the commonest Hong-Kong ferns belong to the real shield-ferns, *A. molle*, Sw., and *A. unitum*, Sw. Both are alike, and apparently resemble the English male fern, *A. filix-mas*, but if the student examine them closely he will find a connection in the veins at the sinus, or bend of each little division, or lobe. Of the veinlets that branch regularly up each segment, a pair meet and terminate at every bend or cut. This meeting of veinlets constitutes the main difference between two of the largest subdivisions of this enormous genus, viz. Lastrea and Nephrodium. *A. molle*, Sw., and *A. unitum*, Sw., are both about two feet high, and grow everywhere in the hills and in the town. *A. molle* is a light green, soft and downy ; *A. unitum* is darker and more shiny, the former has very few very small sori, often found only close to the rachis. In *A. unitum* the fructification is dark-coloured, densely-crowded, and closer to the margin of the lobes.

Gen. XI. Meniscium, Schreb.

M. simplex, Hk., is not uncommon at the Peak, and is easily distinguished by the very marked raised veins, laid as it were like net-work all over the under side of the frond, which is about 4 or 5 inches long, entire, and very finely pointed, having two half-lobes at the base more or less detached from the main-stem. The long delicate apex is often half the length of the entire leaf. The fertile portion differs materially in being much longer, much narrower, and more upright than the sterile, and closely packed with the fructification, which is brown and destitute of covering.

Gen. XII. Polypodium, Linn.

Every polypody does not resemble our old friend in England, whose yellow buttons of sori and favourite haunts on old trees and ruined walls render it familiar to us all. The technical distinction is the absence of indusium (often overlooked in aspidium, when the indusium is sometimes obsolete or lost).

There is no polypody common to this neighbourhood. The searcher in the hills might perhaps be rewarded by finding *P. adnascens*, Sw.—a little fern covered with furry down on the under side, and round sori, or *P. lingua*, Sw., rather larger, with less down or tomentum and sori at further intervals. In both ferns the frond is entire.

(*To be continued.*)

An Excavation carried on by the German Government is said, in the *Times*, to have been in process near Schladebach, with the object of obtaining further information as to the increase of underground temperature. At 1392 metres, the depth reached at the beginning of this year, and believed to be the lowest yet attained by boring, the temperature was 49° C.

THE VARIATION AND ABNORMAL DEVELOPMENT OF THE MOLLUSCA.

Part II.

Limnæa glutinosa. This remarkable species belongs, not to Limnæa proper, but the genus Amphipeplea of Nilsson, and is easily known from Limnæa by the fact, that when alive the mantle covers the shell, and in this way and in the texture of the shell it is related to *Physa fontinalis*. This species is rare and local, and does not vary so much as some of the allied species. In the district we are now dealing with, it has been recorded as living on Barnes Common ; my brother has specimens from Deal, Minster, and Sittingbourne, and I have found it abundant but local in the St. Nicholas Marshes, where it is easily seen on the leaves of *Nuphar luteum* and other plants. These St. Nicholas Marsh specimens are rather light in colour, and it was there I found a most curious and interesting monstrosity or variety, which has much the relation to the type of glutinosa that *L. involuta* has to *L. peregra*.

This specimen has the spire very short, and sunken, but slightly raised at the apex ; the body whorl is swollen above, and the top of the shell appears nearly flat. Should this form turn up in any other localities it might be called monst. *intortum*, but as long as we have only a single specimen I think it is better unnamed.

Limnæa peregra. This is the commonest and most variable of our freshwater mollusca.

I have taken a very globose form, probably var. *ovata*, in the Regent's Canal, where the water is stagnant and there is very little weed. (I record the kind of situation when possible, as one often finds that facts, seemingly of no account, are afterwards valuable in drawing conclusions as to the origin and use of variations.)

A specimen from Chislehurst is slightly decollated, specimens from Bromley and Eltham are somewhat thinner than usual, but my thinnest specimen was taken by my brother at St. Nicholas Marsh. I have an exceeding thick and apparently semi-fossil shell from Barnes, and from what has been said above concerning the Barnes shell it seems improbable that it could have recently lived on the spot. This species occurs fossil at Crayford, but the specimens do not differ from those now living. I have a succinea-shaped specimen taken in a well at Farnborough, it is possibly the variety *succinæformis* of Jeffreys. A monstrosity from Kew Gardens has a wide and deep umbilicus. A shell I found in a ditch close to Walmer Castle has a rather long spire with a fairly deep suture, and has a number of confluent whitish bands all of which are below the periphery. (It is remarkable that whenever bands are abnormally developed in the genera Limnæa and Physa, they are

usually, as far as my experience goes, below the periphery.)

There is a pond at Bromley where *L. peregra* occurs. The specimens are very variable in shape, and are covered with some kind of growth which makes them appear almost black outside, and greyish within. They are infested with a parasite, which my brother tells me is a very beautiful microscopical object, but I have not yet examined any microscopically myself. Some of these shells have a very expanded lip, and belong to the var. *labiosa*, Jeff., and in some cases the lip of the shell is even reflected upon itself, so that the mouth presents a rounded edge formed by the inner surface of the lip which by the reflection becomes outermost.

L. auricularia. The var. *acuta* is recorded for Kent. Specimens from Regent's Park have a rather long spire and are pale in colour.

L. stagnalis. Var. *fragilis* has been taken in Middlesex and Surrey. Monst. *scalariforme*, Chislehurst (S.C.C. and T.D.A.C.). Monst. *decollatum*, Barnes.

A variety (which might conveniently be called *expansa*)* lives in a small pond at Bromley, where the type form does not occur. It has a short spire, the body whorl is large and expanded, and the mouth of the shell wide ; the length of the spire is about ⅜ of the total length of the shell, which is somewhat less than an inch and a half. The only weed I noticed in the pond was *Lemna minor.* A specimen of *L. stagnalis* taken at Deal is slender in shape, light in colour, and has a shallow suture. Shells from a small pond on Chislehurst Common, on the contrary, are dark in colour, and have a deep suture (two specimens being actually scalariform, as stated above), and these shells are a good deal smaller than the type form ; some specimens, apparently full grown, being about two-thirds of an inch in length, although others are much larger. Should these be found elsewhere, var. *elegantula* would perhaps be a suitable name for them.† Another pond, also on Chislehurst Common, produces quite a different variety. This form has a very shallow suture, and is not unlike some varieties of *L. palustris.* It is never so large as the typical *stagnalis*, the usual length being little more than an inch. Why these two ponds, only a few hundred yards distant from one another, should produce two forms so totally distinct, I cannot imagine ; the soil appears to be the same, and the only difference I can detect is that the one having the first variety is in the open, is very small, the Limnææ being very crowded, especially in the summer, when the pond is almost dried up, and the food plants are *Potamogeton* and *Ranunculus*. The second pond is partly under the shade of a chestnut tree ; it is much larger and not so crowded, and the principal food-plants are *Anacharis* and *Callitriche.*

From a third pond on Chislehurst Common I took a specimen having whitish bands below the periphery, like the Walmer *L. peregra.* Specimens from Grove Park have a pointed and slender spire, and the lip tinged with pink.

I will now venture to say a few words about the naming of varieties. There are some who would name every variation that can be defined, and others go to the other extreme, and will have nothing to do with varietal names. To me it seems that as every, or nearly every species has one or more marked variations from what is called the "type," and likewise a number of less definite varieties connecting one form with another, it is extremely difficult to find an intermediate course between giving names, or ignoring them altogether. Suppose, for instance, in the present paper, I had refused to accept any varietal names, but had written out a full description of each variety, what a deal of space would have been uselessly expended ; and the difference between the space taken up by the names of described forms and descriptions of undescribed ones, is well shown above. "But," some reader will exclaim, "you will be naming almost every shell that passes through your hands, and my memory will be burdened with thousands of names which are really of no importance ; and although a species is a tolerably fixed point, varieties are infinite, and naming them can only end in confusion." These are sentiments I have heard expressed.

I would reply to this, that the varietal names are principally of use to specialists, for it is manifest that a general student of conchology is scarce able to study all the variations of all the species ; but to one studying any particular genus or species, the varietal names are most useful and almost indispensable. In proof of this I will ask, How many specialists have been obliged to make varieties, and how many have done without them ? I fancy the former are in the majority. And some think that a species is a fixed point. To these I would recommend the study of *Pisidium.* Others say that varieties are of no importance ; I contend that they are of the greatest importance, but I cannot enter here into the reasons why they are obvious enough to most people.

As for burdening the memory, this is an equally good argument against bringing forward any information whatever, and against names in general. Lastly, I would remind those who do not already know it, that all names, generic, specific, or varietal, are merely a matter of convenience, and although it is open to anyone to propose names, no one is obliged to accept them unless he finds it convenient to do so. Some people, however, seem to think that a sort of mysterious change comes over a specimen when it has a name tacked on to it, and its value goes up 95 per cent. I think it would not be a bad idea if at periodical

* Unless it should prove identical with the variety *lacustris* of Moquin-Tandon, or the variety *fucinensis* of Paulucci, both of which it resembles, in some respects at any rate.

† Mr. Taylor, of Leeds, is of opinion that this form does not differ from the var. *botanica* of Clessin.

times the opinion of the conchological world were invited as to the advisability of accepting names proposed in the interval, and these names rejected or accepted as it might be found convenient. But the worst of it is that people will follow their own opinion in such matters, whatever others say. It may be asked here, what are the convenient names, and which the inconvenient ones? In my opinion the convenient ones are those which apply to varieties which are widely distributed, and consequently have often to be referred to, or for any other reason often spoken of, and which express as well as a single word can express, the leading feature of the form in question. Constantly recurring monstrosities I would place in the same category. Names which I would reject are those which refer to a single specimen, no similar one having been found; but of course, should the form be found afterwards in several places, the name might again be taken up. Also those which do not clearly express what is meant in the description given for them, as var. *major*, "shell larger than type," without saying how large, or var. *elongata*, "shell elongated," when no length is stated, and also all those named after the discoverer, or anyone else, such as *Clausilia rugosa*, var. *Everetti*, "shell smaller than type." So in the names I have suggested above, I do not for a moment propose that they shall be used on the strength of one or two specimens, but merely propose them as useful names, should it be found at any future period convenient to use them.

Fig. 118.—*Limnæa glutinosa*, monst. "*intortum*." S. Nicholas Marsh, E. Kent.

Fig. 119.—*Limnæa peregra*, small variety. Sub-alpine stream, Baildon, Yorkshire.

Fig. 120.—*Limnæa peregra*, var. *labiosa*. Bromley.

Fig. 121.—*Limnæa stagnalis*, var. "*expansa*." Bromley, Kent.

Fig. 122.—*Limnæa stagnalis*, variety approaching *L. palustris* in shape. Chislehurst.

Fig. 123.—*Limnæa stagnalis*, var. "*elegantula*." Chislehurst.

Fig. 124.—*Limnæa palustris*, monst. "*turritum*."

Limnæa palustris. Var. *conica* has been taken in the Thames. Some which I took in a ditch near the river at Putney, Mr. Kenneth McKean considers to belong to this variety, but although they are lighter than usual, they are hardly greyish-white, and the suture is, if anything shallower than usual. Var. *tincta*, St. Nicholas Marsh (S. C. Cockerell). In these specimens the suture is exceedingly shallow. Var. *albida*, Minster (S. C. C.). I have taken it at Sandwich. Monst. *decollatum*, Barnes. Monst. *carinatum*. Mr. J. W. Taylor described this from a specimen found by my brother in a pond at Bromley. I have searched this pond, but have not found another carinate specimen, although the type is common enough; but while looking for *carinatum* I found another monstrosity, equally curious. It was a turretid specimen, which may be described as follows:—Shell about half an inch in length, whorls 5, spire turretid, suture deep, last whorl more than half the total length of the shell, and flattened at the sides, instead of being rounded, as in a typical specimen. The upper whorls are somewhat eroded.

This specimen reminds one of a monstrosity (*imperiale*, I think it is called), of *Buccinum undatum*, and gives the idea of a specimen which had become telescopic, and had got partially shut up. If it is to be named, it might be called monst. *turritum*.* Monst. *globosum*, Taylor, Enfield, one specimen (S. C. Cockerell). Although this was described as a variety, I have no doubt whatever that it is really a monstrosity, and my brother is of the same opinion. My brother has taken two specimens of a very interesting variety, which has the whorls compressed, the suture perfectly flat, and the periphery bluntly angulated; in fact, this form bears exactly the same relation to *L. palustris* type, as *Buccinum acuminatum* bears to the typical *undatum*. (The correspondence between the abnormalities of *L. palustris* and *B. undatum* is very curious, especially as the two species are so distantly related.)

* Kreglinger mentions a var. *turrita*, which may possibly be identical with the form here described.

Limnæa truncatula. Var. *albida* is said to have been taken in Surrey. At Bickley I have found a specimen with two broad whitish bands below the periphery. One of my largest specimens is from a small rivulet in Camden Park, Chislehurst, which is dried up for the greater part of the year. *L. truncatula* is fossil at Crayford.

Ancylus fluviatilis. In our district, at any rate, this shell varies little except in size, and the same may be said of *A. lacustris.* The latter species, however, is occasionally compressed at the sides.

T. D. A. Cockerell.

(*To be continued.*)

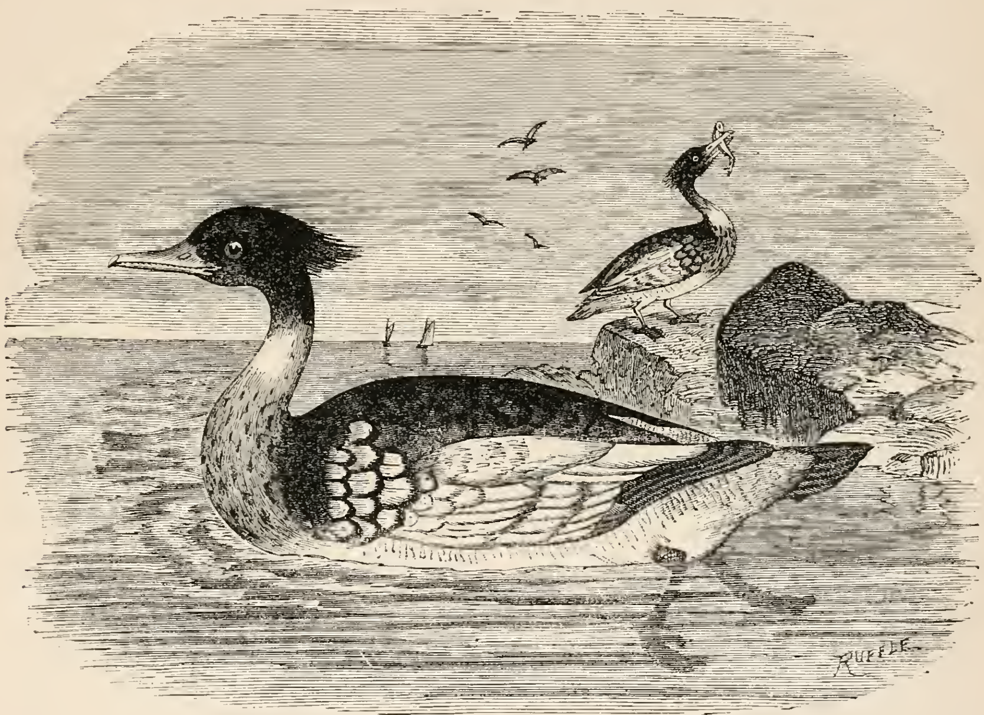

Fig. 125.—Red-breasted Merganser (*Mergus Merganser*), Yarrell. (The larger bird after Morris.)

THE RED-BREASTED MERGANSER.

By P. Q. Keegan, LL.D.

About the period of the autumnal equinox, at the time when the winds, let loose from their summer-caves, sweep with wild and fitful fury over land and sea, then away among the quiet, retired recesses of some sheltered bay, there may frequently be discerned a most beauteous sea-bird. Arrayed in an apparel of the most gaudy and varied hues, with neck and head and movement correspondingly beautiful and graceful, the appearance and deportment of this bird may challenge universal admiration. His accomplishments, too, are by no means to be despised. His sight is of the sharpest, most far-reaching description, his vigilance is indefatigable, and let but pressing danger be apprehended, and lo! he dives beneath the water with marvellous promptitude and dexterity. Where is the sea-fowler that can overmatch the astuteness and agility of this beautiful bird? The gun is presented, and well and truly pointed; the trigger is pulled, but ere the comparatively sluggish shot can reach its mark, the creature has vanished—disappeared, as if by magic, to nestle in the chambers of the deep, completely out of sight and in security.

During the dry and parching summer season, the red-breasted merganser (for that is the name of this beauteous sea-bird) sojourns for the most part amid the desolate solitudes of the Arctic regions. The cares and anxieties attendant upon the breeding duties harass him then; but let no one suppose that, at this time, his lot is unhappy and difficult to bear. Let no one think that there he encounters no warmth or geniality of climate, no green vegetation, no sunlit skies or gleaming sea. We know that there is a broad space around the pole—a "thrilling region of thick ribbed ice" where, during certain months in summer, the sun perpetually shines, his light never fades, never gives way to night, though sometimes it is seriously intercepted by fog, which, however, chiefly occurs seaward; he careers all day and night in the heavens, and thereby concentrates such an

intensity of heat upon certain sheltered portions of the land, that the temperature thereof frequently surpasses that of the tropics. Captain Scoresby during the course of his survey of the eastern coast of Greenland, having landed one day on that desolate shore, found the temperature of a certain spot amongst the rocks to be 70°, and he describes the effect thereof as being particularly relaxing. A lavish and widespread vegetation too, decorates these northern shores from June till about September, and furnishes ample opportunity for the prosecution of breeding undertakings on the part of sea-birds. In order, however, to illustrate the fact, that birds can nidify at a comparatively low temperature, we may mention, that, on the 21st of June, 1853, an ivory gull (*Larus eburneus*) was found sitting upon its eggs in a small island to the north of Melville Sound (lat. 76°), when the thermometer indicated only 35° of heat.

As soon as the breeding duties of our bird have terminated, and the new-fledged brood can provide for themselves, and when the terrible rigours of the Arctic winter—the sleet-charged blasts, the blighting fogs, the destruction of vegetation, the soul-depressing silence and frigidity of all things—commence to be experienced, then he abandons his summer seat, and travelling southwards, settles in more genial latitudes. With strong, rapid unflagging flight, he poises in the air over the dreary shores of Greenland, Newfoundland, or Hudson's Bay, and bidding them farewell, advances briskly for days and days till he lands securely in Shetland, in Orkney, in Sutherland, or the Hebrides, &c., and there, in conjunction with his "co-mates and brothers in exile," forthwith commences his winter campaign of diving, fishing, glutting, &c.

Unlike the great black-backed gull, the beauteous northern diver, the Fulmar petrel, &c., the bird now under review is of a decidedly social disposition, and, on that account, is more frequently to be seen in flocks than in a solitary state. Its voracity is excessive and generally known ; and we need not wonder, therefore, that its principal occupation consists in the pursuit, capture and consumption of various species of fish, especially sand-eels, for which it manifests an especial relish. The following is the method of procedure.

The bird swims about gracefully upon the surface of the sea for some little time, occasionally poking its head and neck beneath the water, as if searching about for some delicate morsel, then, suddenly elevating its body, and plunging straight ahead, it instantly disappears from view. Its comrades, suspecting that some sport is to be had below, follow suit; so that the entire flock seems to vanish, as if by magic. After traversing the watery regions with considerable swiftness and dexterity (using the wings as well as the webbed feet), the merganser appears once more above the surface, bearing a fish in its mouth, and looking as lively as ever. The booty is soon disposed of down "red lane," whereupon the bird drinks a little water by way of condiment or digestive, or perhaps to wash the meal down more thoroughly ; and then gleefully flapping its wings, it appears eminently satisfied with the entire proceeding. To inspect a pair or more of these birds fishing in some shallow lake left amid some far off waste of sand by the receded tide, is an extremely interesting occupation. Such graceful movements, such displays of agility, such attractive forms and colouring cannot be discerned every day within the circle of human intercourse. He who, towards the autumn or mid-winter, occasionally devotes an hour or so to the study and contemplation of sea-bird habits and deportment, will assuredly not repent of the proceeding. The ever-varied and beautiful tints and shades of ocean, the bleakness and desolation of open wastes of beach-sand, will touch his heart, and impress grateful ideas on his mind that will haunt him for years.

The lavish prodigality of life-energy expended by the red-breasted merganser, the pungent stimulating character of the regions which it inhabits during the most important period of its existence, conspire with extensively endowed digestive powers to render it excessively voracious. The mouth is provided with a number of fine, conical, saw-like lamellæ or teeth, viz. about sixty in the upper jaw and about thirty-five in the lower. The œsophagus also is specially large and dilatable, so that ample provision is thuswise made for the capture, steadfast seizure, and the storing up of a liberal amount of edible matter. Sand eels are especially delectable to the gustatory organs of the bird. Away upon a desolate waste of sandy shore, damp, pool-bespread, and wreck-strewn, the bird establishes itself, and commences the operations necessary to the procurement of victuals. It perseveringly digs its sharp beak into the retreats of the sand-eel, until a desiderated morsel is grasped. This species of eel is of a beautiful silvery colour—a very delicate fish about five or six inches long ; so that the merganser in whose body it is recorded no fewer than twenty-four of these were found, had managed, we should say, to obtain a pretty good dinner of it !

Hovering on the confines of the comparatively clumsy Anatidæ, the mergansers seem to have borrowed some portion of their marvellous beauty and gracefulness from the allied family of the Colymbidæ. The diving powers of our bird are remarkable. It is shy and wary, with sharp ears, and exceedingly acute and far-ranging vision, and so completely, so adequately and promptly can its bodily movements be adjusted to the dictates or promptings furnished by the senses—so intimately associated and dependent are its motor and sensor nerves—that when a sea-fowler fires off his gun, the bird dives with incredible dexterity, disappearing from

view ere the shot can reach the now deserted seat. The predilection of the bird for red colour, however, is the snare which frequently proves fatal. It is recorded, that this merganser exhibits a weakness for the fascinations of this colour, and that the Swedish hunters, aware of this fact, frequently take advantage of it, and by wearing red clothes become enabled to approach much nearer, so as to direct their fire with more sure and deadly effect.

The wings of the red-breasted merganser are only of moderate length (not extending to the tail),—and of moderate breadth. The body, like that of the divers (Colymbidæ), [is comparatively heavy, weighing in an ordinary specimen about two pounds. Yet, notwithstanding the unfavourable circumstance, the flight of the bird is undoubtedly strong, swift, and remarkably well sustained.

Now if we compare these facts with those furnished by an inspection of the flying apparatus, of, say the great black-backed gull (*Larus marinus*), we shall perhaps be able to glean some grains of ornithological truth. Have you ever observed the mighty sweep of this gull's wings? They measure five feet across, and the weight of the bird itself is, on the average, only about three or four pounds. Now, if we compare these various weights and measures with those of the body and wings of the red-breasted merganser, the important truth may flash upon us, that the greater the weight of a bird, the less proportionally is the spread of the wing necessary to sustain its body in the air. In the consideration of the flying capabilities of a bird, let us never forget the fact, that, in heavy birds, the motion of the wings in the act of flying is comparatively slow, while in light birds, it is comparatively swift. The former circumstance is illustrated in the dilatory, lazy-paced, ungainly flying of the crane, the heron, &c., the latter in the marvellous agility of wing displayed by the sylph-like petrels, skuas, terns, &c. It seems, too, to be an indisputable fact, that the larger and weightier birds, when once fairly launched into the air, can sustain and propel themselves with a much less expenditure of animal energy than that required from the smaller and less ponderous among the feathered tribes. Those naturalists who have marvelled at the apparently excessive muscular exertion involved in the flight of birds, have, when the facts have been more thoroughly examined and elucidated, become sensible that the strength of these aerial creatures is not so grievously taxed as they formerly supposed.

The red-breasted merganser, ever beautiful and accomplished, and not exhibiting any very marked or reprehensible meddling, domineering, piratical or other objectionable proclivities, may be fairly ranged as regards "social position" on the same level with the "aristocratic" divers. Inspect and feel the soft, close, blended, velvety plumage of this latter group of sea birds, and compare it with the hair of the thorough-bred horse, or even (if such be allowed) with the locks of the well-bred gentleman, and then declare if, as respects this important constituent of their external aspect, they are not entitled "to flourish in any society." To speculate upon the social position or upon the respectable appearance of birds, may appear ridiculous; but my observations and studies in Natural History have been wholly valueless, if roughness or smoothness, coarseness or refinement in the external integuments, in the hair, nails and other appendages of animals, does not stand as a sign and index, a mark and register of something more recondite and fundamental, of something intimately connected with the most elementary organic structures, and with the ultimate fountains of animal energy.

Every movement of these mergansers is pre-eminently graceful. The stream of their animal energy flows easily and readily, and through as it were a smooth and well-worn channel. The bone-joints seem perpetually well-oiled and competent, and the muscular apparatus is thoroughly sound and destitute of deteriorating fatty admixture. The instruments of bodily movement being thuswise constructed of sound and unexceptionable materials, and being admirably adapted to the end for which they were proposed, the utmost ease and harmony of movement may be expected. To endeavour to furnish an explanation of the admirable quality of gracefulness exhibited by animals, would be a supremely interesting undertaking; but it is one from which the restricted limits of our space warn us to desist. We have no doubt, however, that this quality depends entirely upon (1) hereditary endowment, and (2) the manner in which, during youth and early life, the various bodily movements have been conducted, and the consequent change and modelling as it were of the organism in accordance therewith.

The hand of Nature has been employed so assiduously in the lavish decoration of the sea-birds under review, now touching with red and green, now patching and interlaying with yellow, white and black, now dropping spots of black and grey, and shreds of scarlet, and polishing all into soft and uniform lustre, that fain would we be excused from recounting the specific delineation thereof. We must rest content, therefore, with a notice of the more conspicuous and important peculiarities of colouring, &c., as exhibited by the male bird during the breeding season. We know not how it comes to pass that among many tribes of the lower animals, the male is much handsomer, more attractive in appearance, more gaudily attired, than the female. Perhaps the lady in this case is more coy, or more fastidious in the selection of a mate; or mayhap the superior attraction of the males of her own species may counteract any inclination on her part to extend favours to individuals not holding precisely the same position as to organisation, &c., in the animal world.

The following account of the specific characteristics of the male red-breasted merganser (*Mergus serrator*) cannct be regarded as complete:—The head is decorated with a long loose crest of a glossy dark-green colour; the upper mandible is reddish-brown, the lower one is of an orange tint; a few rather large feathers, of a pure white colour margined with black, crop out from each side of the breast, and fold over the wings when these are at rest; the upper breast is reddish-brown, the lower is pure white, but when the bird is just recently killed, there is thereabouts a beautiful salmon-colour tint; the outside of the tarsus and toes, and the webs are of a purplish shade, while the claws are of a light greyish-brown. The total length of the bird is about twenty-one inches. As is the case with almost all the Anatidæ, a most important specific indication is afforded by the appearance of the trachea. In the red-breasted merganser, the structure and arrangement of this organ are so singular as to merit a detailed description. Two inches from the mouth, it swells out to four times its diameter, an enlargement which it maintains for the space of two inches and a half; it then continues as at first for another couple of inches, when it becomes flattened for the same distance further; it finally appears under the form of a bony labyrinth which measures two inches long, by one and a half in breadth, and which is covered with a yellowish skin-like parchment.

This species nidifies from about March till May or June. Greenland, Newfoundland, and the shores of Hudson's Bay are the localities which have been notified as its special haunts during the breeding season. But away along the margins and among the islands of the more lonely and secluded Highland lochs, the nest of this bird has been frequently discovered. It is said to be commonly situated amongst brushwood, and at a few yards from the water, and to be warmly constructed with the down taken from the bird's own body.

The persecution to which this beautiful bird has been subjected by the human race for ages past, may be inferred and estimated from the contemplation of its incomparable diving powers, and by its shyness and general deportment when pursued. The love of power inherent in man, which, in the destitution of other means of gratification, seeks to slaughter the beasts of the field and the birds of the air, has been especially directed against this beautiful merganser. We cannot here enter into a discussion regarding the relation which may subsist between the shyness and vigilance of the bird, and the amount or kind of persecution to which it has been subjected, since the unlucky period when it first became known to human beings. Nor can we venture to suggest a cause or reason for the gorgeous apparel with which it has been clothed. Neither can we confidently pronounce whether this ostentatious drapery subserves any particular purpose, whether it exists only to please the eye of man, or whether the bird is beautiful for the mere sake of beauty. All these questions are replete with interest, and furnish ample material for the reflective and thoughtful mind; but, at the same time, they are fraught with danger. They contain many mazes and labyrinths, which are difficult if not impossible to thread, and which are ever liable to land the rash and unwary speculator in quagmires and obscure haunts, where the glorious light of religion is for ever quenched. Perhaps the most unequivocal mark of design, connected with the subject of our paper, is the peculiar structure of the beak. Unlike that of the generality of the duck family, it is adapted, not so much for straining the water and the sandy particles from the edible morsel within the mouth, as to effectually seize and firmly retain the solid body of a fish.

PELORIC FORM OF *ORCHIS MASCULA*.

PELORIA, or the regular form of flowers normally irregular, seems to be most common among flowers with spurred petals. In Linaria, with one spur, the flowers are sometimes altered so that all the petals are spurred. In Columbine, on the other hand, with all the petals spurred in their normal condition, forms are sometimes found with the spurs suppressed. For peloric forms to be found among the orchids is, however, much less common. We have, growing wild, in this neighbourhood, about three plants which every year produce these curious forms. I first found them last year, and sent specimens to two or three friends, who, like myself, were much puzzled, and could make nothing of them. One gave it up in despair, another thought the plant might be *Epipactis purpurea*, but could not make form of ovary to agree. This year I submitted specimens to Dr. Hooker, who was much interested with them, said he had seen nothing like them, and pronounced them to be peloric forms of *O. morio* or *mascula*. After subsequent examination and information he decided upon *mascula*. I regret I have not a specimen to send for engraving, and my description, from memory, must necessarily be vague. I hope, however, to remedy these defects next year. The most striking difference is in the form of the lowest petal, which, instead of being much larger than the upper pair, and spurred, is equal in size and form to the other two, and without the spur. The petals of the upper pair are larger than in ordinary forms of the flower; all are purple and without spots. The calyx is coloured like the corolla, the three sepals are about the usual size; so that the floral leaves, six in number, are alike in colour and size, and the perianth is therefore regular. As there is no spur, and therefore no apparent receptacle for honey, it seems difficult to understand how this form can be reproduced. A friend of mine informs me on the authority

of Professor Babington, of Cambridge, that, so far as he is aware, these spurless orchids have never before been found in England. I hope my remarks may have the effect for which they were intended, of sending out some next year, to look more carefully among the orchids, to see if these forms are really so uncommon as they at present appear to be.

JOHN RASOR.

Woolpit, Bury St. Edmund's.

OUR SEA-ANEMONES.

By H. C. C. M.

"WHERE did you get them from?"

"What do you feed them on?"

"How often do you change the water, and where do you get your supply of fresh water from?" Such are the questions we have answered repeatedly since we began to keep anemones, and as our efforts have been attended with much success, we venture to think a record of our experiences may be acceptable to many readers of SCIENCE-GOSSIP.

One fine afternoon, towards the close of our stay at Beaumaris, in July 1883, we went down on to the beach just as the tide reached its lowest ebb, bent on anemone collecting. Our outfit consisted of a fish-can and a pocket knife. The hammer and chisel recommended in the books were left behind, being unnecessary and burdensome.

We had not proceeded far before we came upon several specimens of the common daisy anemone (*Sagartia bellis*), and as we had determined that this species should be the subject of our first experiments, we very carefully detached them with the blade of our pocket knife from the large pebbles to which they adhered, and transferred them to a small quantity of clean sea-water in our fish-can. In less than an hour we had collected more than sufficient for our purpose, so we examined our captures, and, after selecting six of the largest and healthiest-looking, we put the rest back into the sea. "Have you been exploring a bit?" said a lady to us as we neared the pier. Our explanation of the purpose of our exploration brought a look to our friend's face that spoke volumes. What attraction "nasty lumps of jelly" could have to young men like us seemed a mystery, and we were going to take them all the way to Manchester too! On the following morning we hired a boat, and taking with us a gallon glass jar and some smaller bottles, we rowed into mid-channel. Here we filled our jar and bottles with sea-water and collected a quantity of floating sea-weed in which to pack our anemones, an operation which we performed just before leaving Beaumaris for home in the afternoon. A layer of wet sea-weed was put at the bottom of the fish-can, the anemones laid upon it, and covered with another layer of the same.

Upon our arrival at home we inverted two propagating glasses, each about twelve inches in diameter, fixing one in a turned wood stand, the other in a bed of saw-dust contained in a glass sugar basin. Into each glass we put a quantity of well-washed gravel and two or three fragments of limestone, and after pouring in the whole of our sea-water, we transferred our anemones to their new home, putting three into each glass. Our efforts were soon rewarded. Tentacles were protruded, and after sundry peregrinations round their glasses, the daisies settled down into the positions which they occupy to-day. But imagine our dismay when, a day or two later, we saw that the water had assumed a milky hue.

We thought we were doomed to disappointment, especially as the milkiness seemed to increase. But seeing that the anemones were fully expanded, and apparently unmoved by the threatening state of things, we took a glass syringe and with it vigorously syringed the water. This had the desired effect. The cloudiness soon disappeared, but we continued to syringe the water almost daily for some time, and still do so occasionally.

Our next care was to provide the anemones with suitable food. We bought some mussels, and with a knife cut several of them in half. We then removed the leaf-like gills with a pair of scissors, and after cutting them into small pieces, gave a morsel to each with a pair of wooden forceps. The jack-in-the-box-like celerity with which the tentacles closed over the food, and its speedy disappearance into the digestive cavity showed that it was appreciated, and the completion of the process of digestion was duly announced on the following day by the ejection through the mouth of rounded pellets composed of the innutritious residue. These were carefully removed with a pipette. Feeding time has since recurred at intervals of three weeks or a month. One morning early in the following month we noticed on the disk of one of the daisies a small pearly-white body. What was it? A young one, sure enough. The next day saw the infant fixed on a small pebble, beginning life on its own account. Another and another soon followed, and by the end of the year about twenty had made their appearance.

But the rate of increase in July and August last year astonished us. Three adults, during those two months, gave birth to at least seventy young ones, about forty of which we distributed at a subsequent meeting of the Manchester Microscopical Society. During the earlier months of the summer we had frequent opportunities of observing the very young larvæ. They are small, somewhat pear-shaped, ciliated planulæ, the pointed anterior pole of which carries a tuft of longer cilia, the opposite end somewhat flattened, bearing the mouth in its centre. They swim freely with a peculiar oscillatory movement.

The hot weather during the above-mentioned months seemed to promote the growth of a filamen-

tous alga on the glass and the surface of the water, and as it obscured our view of the anemones we decided to remove it. This we did with complete success by drawing off the water with a siphon, and then wiping the surface of the glass with a clean duster. We also removed some of the gravel, and replaced it with fresh, afterwards filtering the water into the glasses again. A short visit to Beaumaris in June afforded us an opportunity of obtaining a reserve supply of sea-water. This we did, and upon our arrival at home put the whole into glass bottles, each holding a quart. We also brought a single specimen of the smooth beadlet (*Actinia mesembryanthemum*). Like the daisies it soon commenced to explore its new home, but did not seem to be so satisfied, for after two days had elapsed the tentacles were retracted, and for some weeks it remained in an apparently lifeless condition, from which, at first, even food failed to arouse it. However, after several unsuccessful attempts, we at last induced it to swallow a bit of mussel, and it has since then taken food and displayed its beauties in such a way as to remove all doubt as to its healthiness.

Having been so successful in our first attempt at anemone keeping, we determined, during a holiday in September, to try what we could do with one or two less common species. A visit to Rhoscollyn, Holy Island, where the green opelet (*Anthea cereus*) abounds, afforded us an opportunity for collecting specimens of that beautiful species. We selected three small ones, and with two dahlia wartlets (*Tealia crassicornis*), and another smooth beadlet, started our second venture upon our arrival at home five days later. The glass into which we put our new captures is nearly twice the size of the two mentioned above, and having a flat bottom it affords a better view of its contents than the ordinary propagating glass. We may here remark, that we have constantly kept a close fitting glass cover upon each tank, to keep out the dust and to prevent evaporation. Our reserve supply of sea-water now proved useful, though we had filled all our spare bottles before leaving Beaumaris. The green opelets were at home in a few hours, and took food readily on the following day. About a week later, we noticed that one of them was about to undergo the process of fission. The disk by which it adhered to the glass was divided by a constriction into two halves, and each half seemed to be trying to move away from the other. Three days later there were two distinct disks, and the constriction had extended up the column to the base of the tentacles. The next day found the two halves further away from each other, and a portion of the digestive sac was exposed, forming a sort of connecting link between the two. The final separation took place on the ninth day. The dahlia wartlets refused food for some time, but they now take it readily, and are apparently in perfect health. We recently introduced a small mussel (*Mytilus edulis*), and have been much interested to observe the behaviour of the green opelets towards it. The stone to which it has anchored itself has, since its introduction, been their favourite resting-place, and we have several times seen one or other of them seated upon its shell.

SCIENCE-GOSSIP.

According to the "English Mechanic," the passage of the electric fluid between terminal brushes of very fine platinum wire was shown under the microscope at a recent meeting of the San Francisco Microscopical Society. When films of soot of different thicknesses were interposed, "in its passage through these the current was deflected into meandering lines, around which scintillated showers of sparks. The particles of soot could be seen arranging themselves in symmetrical groupings around the terminals."

The Darwin Medal, instituted by the Midland Union of Scientific Societies for the recognition of original research, is this year awarded to Mr. W. Jerome Harrison, F.G.S., senior science demonstrator to the Birmingham School Board.

The cholera has increased to an alarming extent in Spain, and the Spanish Government after permitting Dr. Ferran to resume his inoculation has again withdrawn its permission.

The "Botanical Gazette," speaking apparently of a botanical club in connection with the meeting of the American Association, protests against the "customary practice of botanists, which is to have no paper, or something which would be better unsaid. The disjointed twaddle . . . should be reserved for the privacy of the botanical club." "Every botanist should prepare a brief paper, as compact as possible, and to secure exactness and save time, it should be *written and read*." Excellent advice this last; which might indeed perhaps be extended even to the privacy of botanical clubs in general, not to say other of our scientific societies; and by following which the readers of the papers would be gainers, by the increased exactness which ought to result.

Mr. A. R. Wallace, in a review referred to in another column, says, "It is now generally admitted that the celebrated 'subsidence theory' of the formation of atolls and barrier reefs is unsound as a general explanation of the facts; yet it so fully and plausibly explained all the details of coral structure known at the time, as to command universal acceptance and unbounded admiration."

Professor Huxley, it is announced, is about to retire from his various appointments under Government with a pension of £1200 a year.

Professor Fleeming Jenkins, who occupied the chair of engineering at Edinburgh, died in June last. He was born in 1833, was at one time professor of engineering at University College, London, and was the originator of the scheme of telpherage or electrical transmission.

Professor Thorpe, of the Yorkshire College, Leeds, has been appointed successor to Professor Frankland in the chair of chemistry at the Royal School of Mines.

A few extracts from a pamphlet entitled, "Facts Proving that Lightning is a Composite Force," by Mr. William Boggett, will suffice perhaps to show what it is like. He believes that water consists of hydrogen and oxygen, plus electricity, only that the voltaic current employed by the first discoverers of the gases in water united gently with the electricity and removed it without its removal being discovered. "Dynamos obtain their powerful currents from the water in the earth, which is the great reservoir of electricity." It is, of course, possible to misrepresent a writer by giving detached quotations, but Mr. Boggett certainly speaks of "the discovery that lightning is a *composite force*, consisting of the electric currents, emanating, one from water in the clouds, the other from water in the earth. Each of these currents are united with one of the elements of water—say, oxygen (heat)—the other combined in like manner with the other element of water—hydrogen (light)," and so on. Space is too valuable to do more than just to mention the statement that there is no heat in incandescent electric lamps ("neither combustion nor heat"); that when, at the Polytechnic, men used to point their fingers at suspended electric balls the balls moved one way, but the other way when pointed at by women, and a somewhat similar difference of effects when hats were made to move by "electric contact" of fingers. These last two statements are not on the author's personal authority. One would think he might have tried to verify them, for, speaking seriously, there can surely be no excuse for printing such things without having taken the trouble to put them to practical proof.

There must be a considerable amount of unselfish benevolence diffused among mankind. Else why should the Bread Reform League in two years and a quarter have received over £270 towards the expenses of inducing people to eat wheat meal bread instead of white bread? The donors and subscribers could enjoy the privilege by themselves alone if they pleased. However, a Report lately issued gives a short statement of the financial accounts from December 1882 to last March, and it further appears that the use of wheat meal bread is increasing, and that the article itself, as sold by bakers, is improving in quality. The Report is dated from 36, Coleman Street, London, E.C.

In the "American Monthly Microscopical Journal" for June may be found a short paper, with illustrations, on the microscopical structure of tea-leaves; and a continuation of the provisional key to the classification of freshwater algæ.

At the May and June meetings of the Entomological Society of London, Mr. F. Enock, of Woking, read a most interesting paper on the life history of *Atypus piceus*, Sulz., the only British representative of trap-door spiders. His observations, made from 1876 to the present time, were detailed with great care and minuteness, and many interesting facts in the spider's economy established. The paper was fully illustrated by the exhibition of numerous specimens of the nests, spiders, &c., from Hampstead and Woking.

From a return lately issued from the Home Office, it appears that those among us who oppose vivisection have not much ground for objection on the score of painful experiments in this country in 1884. Forty-nine persons held licenses during some part of the year in England and Scotland, of whom fifteen did not use them. About 441 experiments were performed under the Act, and, as regards the infliction of pain in those cases where anæsthetics were not used or only partially used, some consisted in inoculation; others, performed for medico-legal purposes, resulted in the death by tetanus of three frogs and six mice which survived only a few minutes, and others again were experiments on the infection of fish with a species of fungus very destructive in certain rivers and streams, or on the effects of the immersion of fish in distilled water which proved fatal to about thirty minnows and sticklebacks. Two other cases involving pain "of a very trifling character," are referred to, and the Report for England and Scotland ends by saying that the amount of direct or indirect suffering may be stated as "wholly insignificant," while the report for Ireland says that the experiments performed there were all painless.

MICROSCOPY.

Journal of the Royal Microscopical Society.—The June number contains papers on New British Oribatidæ, by Mr. A. D. Michael, F.L.S. on the Structure of the Diatom Shell by Dr. J. D. Cox; and on the Structure and Origin of Carboniferous Coal Seams, by Mr. Edward Wethered, F.G.S., followed by the summary of current researches.

Microscopes with Bent Body Tube.—The above journal gives a figure of a microscope intended to combine the advantages of keeping the stage horizontal, and at the same time the body of the observer in a convenient position. The tube of the instrument has a break in it, the upper part sloping towards the eye, the lower part being vertical; and a truncated equilateral prism is inserted at the junction of the two pieces of the tube.

Motion in Diatoms.—On examining some Spirogyra obtained from one of the fresh-water canals to the east of Calcutta, my eye caught a diatom, which in form resembled the figure of *Bacillaria paradoxa* given in the Micrographic Dictionary. The *bacillaria* is, however, described as a marine diatom; the water in the canal from which this specimen was taken is fresh; and the object was associated with Spirogyra, a fresh-water conferva. The phenomenon to which I would draw attention is the curious motion of the frustules. Forming at the outset a raft (A in the diagram, which is not a picture) composed of six frustules, the outermost diatom on the left slid out along its neighbour, which in its turn glided along the third frustule of the series, and so on, until the raft was arranged as at B B′. The diatoms then slipped back to their first position, and as soon as it

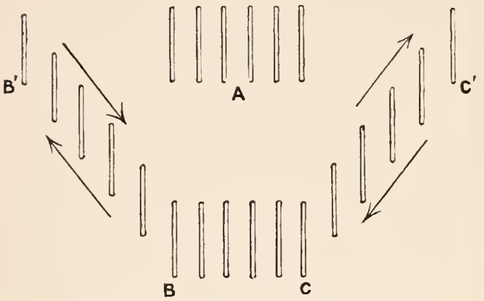

Fig. 126.—Diagram explanatory of movements of Diatoms.

was attained, the outermost diatom on the right-hand started off, to be followed by the whole series, until the position C C′ was attained, when they slid back to the first position B C, and then glided off to the left, and so on, during the whole time the diatom was under observation. This see-saw motion was kept up with a regularity that suggested the working of the shafts and rods of some well-regulated engine. I notice in the pages of that exhaustless mine, the Micrographic Dictionary, that Thwaites described some strange motion in *Bacillaria paradoxa*. Did he observe the same phenomenon I have attempted to describe, or a different one? My diagram is very rough, the spaces between the frustules are exaggerated, for the diatoms were apparently in contact. I could not notice any investing membrane, or gelatinous envelope, and I only hope I shall be able to resume my acquaintance with the object. It was very beautiful.—*W. J. Simmons, Calcutta.*

Helix aspera, var. sinistrorsa.—It will be perhaps interesting to the readers of Science-Gossip to hear, that I have lately found another reversed *Helix aspera* near Bristol. It is a young specimen, and will not attain maturity for two years. I intend to carefully rear it.—*Jessie Hele.*

ZOOLOGY.

Conchological and Malacological Notes.—In Science-Gossip, 1885, p. 163, Mr. T. D. A. Cockerell notices two varieties of *Limax flavus* which I was fortunate enough to find near Middlesborough. I refer to var. *colubrina*, Pini, and var. *virescens*, Fér., and, as Mr. Cockerell seems to be under some misapprehension with regard to the latter, which is possibly due to my not having stated the authorship of the variety, I hasten to make amends. The variety *virescens*, Fér., is distinguishable by its greenish glassy appearance, with the usual markings scarcely conspicuous. The original description runs: Limax virescens, maculis parum conspicuis. This does not agree with the variety *virescens* of Moquin-Tandon, as quoted by Mr. Cockerell. The specimen found by me agreed fairly well with Férussac's description, and I have since taken a highly characteristic specimen in the same locality as the first. With regard to the new variety of *Helix nemoralis* (*Studeria*, Moq.), which Mr. Cockerell proposes to add to the British list, I may say that I have recently been visiting on the borders of Wales, and near Oswestry, Salop, have taken the variety which Mr. Cockerell describes as lilac and bandless. This form is moderately abundant in that locality, associated with vars. *Libellula*, Risso, *Rubella*, Moq., and *Castanea*, Moq., into the latter of which it seems to almost insensibly merge. My Oswestry shells are at present in the hands of the Recorder of the Conchological Society, but on their return to me I shall be happy to send Mr. Cockerell a specimen for comparison. Though the colour renders this shell a beautiful cabinet object, yet I am loath to accord it varietal rank—in fact, without expressing any decided opinion, I am inclined to believe that the present mode of making colour varieties is merely provisional, as, so far as my experience goes, one colour merges into another by such gentle grades that it is next to impossible to say where one begins and the other leaves off, and the student is lost when he seeks to give place, in its rank, to his specimen. I am not, however, prepared to suggest a way out of the difficulty, unless we revert to the division proposed by Sheppard, viz. *H. nemoralis*, Shepp., the plain unbanded form; var. *Cintra*, Shepp., the one-banded, or, according to the present system, 00300, and var. *fasciata*, Shepp., the five-banded form. I do not, however, agree with all his reasons for such separation, but rather because the many varieties of banding and colour are readily referable to one or other of these three. My own observation of *H. nemoralis* leads me to believe that the one-banded form breeds most true, whilst the plain unbanded form generally interbreeds with the other two. As to varieties having such banding as the following, 10345, 02345, 00045, &c., I believe them all to be referable to

the five-banded kind. So far as I have been able to observe, it is the lower bands which are more rarely absent and generally the upper ones which are so, and my attention has recently been considerably drawn to this in the case of *H. hortensis*. Near Oswestry the type form is common, but of the unbanded I did not take one specimen among many hundreds observed. The band variation in these shells was entirely confined to the upper bands, which were sometimes thinned out, sometimes altogether absent. In conclusion, I may say that I have never taken a specimen of either *H. nemoralis* or *H. hortensis* possessing the upper and lacking the lower banding.—*Baker Hudson.*

RANA MACROCNEMIA.—In the lately issued number of the "Proceedings of the Zoological Society of London" is a figure of a new species of frog from Asia Minor. Mr. G. A. Boulenger, F.Z.S., proposes to give the name of *Rana macrocnemia* to this frog, whose nearest ally is *R. temporaria*, and from which it differs in the longer hind limbs and in a few other respects.

ABDOMINAL LEGS OF CATERPILLAR.—The "American Naturalist" for July contains a note by A. S. Packard on the caterpillar of *Lagoa crispata*, Pack., which possesses the unusual number of seven pairs of abdominal legs, and which was first described by him in 1864. It is believed to be the only caterpillar which has more than the normal five pairs of abdominal legs. Two pairs out of these seven pairs are rudimentary, and as the embryology of Sphinx has shown that it has ten pairs of abdominal legs, of which five pairs disappear before hatching, it is supposed that these rudimentary ones in Lagoa may be the survivals of ten pairs of embryonic legs.

BOTANY.

CLOSE-FERTILISATION OF ORCHIDS.—Professor Henslow contributes an article on this subject to the "Gardeners' Chronicle," in which he refers to a paper read at the Linnean Society last December, on "Contrivances for Insuring Self-fertilisation in some Tropical Orchids," by Mr. H. O. Forbes. Mr. Forbes called attention to the general fact that, in Portugal and the Tropics, Orchids, especially adapted for insect agency, are to an enormous extent utterly barren (not two per cent. of the flowers in one case being fertilised), and described several species which exhibit remarkable adaptations for close-fertilisation, thereby more or less preventing cross-fertilisation, and which yet produce abundant seed. Mr. Henslow takes the opportunity of questioning the necessity of cross-fertilisation. He thinks there is no *à priori* ground for assuming that Nature abhors self-fertilisation, and alludes to the large number of cleistogamous flowers, including one in orchids, described by Mr. Forbes. He holds that there is no experimental verification of the theory that close-fertilisation brings about physical weakness, and leads to the extinction of the plant. He refers to his paper on "Self-Fertilisation," in Trans. Linn. Soc. vol. i. p. 17, 1879, as showing that,—keeping in view the only two ends of plant life which he thinks can be recognised, viz. self-preservation and the production of numerous healthy offspring,—self-fertilising plants are incomparably the better off. Species adapted for cross-fertilisation are generally larger plants than allied species adapted for self-fertilisation, and have finer foliage and more handsome flowers, being thus of more value to the horticulturist. Mr. Forbes described *Phaius Blumei*, which was self-fertilising. In *Spathoglottis plicata* and another case the flower was self-fertilised before it opened, an approximation to cleistogamy—*Plocoglottis* (?) being absolutely cleistogamous. From these and other cases, both of orchids and other plants, Mr. Henslow says that all degrees of transition may be found between flowers, apparently well adapted for inter-crossing, yet also adapted for self-fertilisation, and cleistogamous flowers, many exhibiting adaptations for both purposes. Wherefore he traverses Mr. Darwin's conclusion with respect to the Bee Ophrys, when Mr. Darwin says that the survival in it of the apparatus for cross-fertilisation, though the flower is mainly self-fertilised, points to the fact of cross-fertilisation at long intervals. Apropos of this subject, some very interesting remarks by Mr. A. R. Wallace may be found in a review by him, in "Nature," of a book of travels in the Eastern Archipelago by Mr. H. O. Forbes. Mr. Forbes remarks, that the cross-fertilisation of orchids is by no means so universal as has been supposed. (This is probably the sense, though concealed by an apparent misprint.) He mentions a plant related to Chrysoglossum in which, though the labellum is beautifully marked with lines of purple, carmine, and orange, and the column also, the flower fertilises itself without ever opening at all.

GEOLOGY, &c.

GEOLOGY OF THE HIGHLANDS.—In the first part of his paper on the Age of the Malvern Hills (p. 126), Mr. J. Walter Gregory seems to attribute the changed view of the nature of the rocks of the Highlands of Scotland to the investigations of Dr. Geikie. Of this question a somewhat detailed account may be found in the presidential address of Professor T. G. Bonney to the Geological Society last February. Having mentioned the important event of the abandonment by the director general and other Survey officers of the Murchisonian hypothesis, Professor Bonney shows that, before the end of the year 1883, in the summer of

which a detachment from the Geological Survey took the field in Sutherlandshire, Dr. Hicks, Dr. Callaway, and Professor Lapworth had all thrown light upon the subject; while Dr. Geikie was prevented, by want of space, in his paper which appeared in the following year in "Nature," from indicating the share which previous writers had had in producing the result.

CONE-IN-CONE STRUCTURE.—In a paper read before the Geological Society of Glasgow in March, Mr. John Young, F.G.S., described the structures known as Cone-in-cone, and gave an account of results arrived at by him after a careful study of numerous specimens. This structure is found in sedimentary strata of various formations, being, in the Carboniferous rocks of West Scotland, often associated with beds of clay-carbonate of iron of probable shallow lacustrine deposition. Cone-in-cone consists of a series of cones one within the other, arranged vertically with their apices downwards, the broad ends of the upper cones in the case of the larger examples terminating upon the upper surface of the bed in which they occur. Mr. Young thinks the effect, which had been ascribed by previous observers to various causes, to be due to the upward escape of gases generated in the deposit by the decomposition of organisms present in it. An abstract of his paper, with other conclusions arrived at by him, may be found in the "Geological Magazine" for June.

CARBONIFEROUS SHARKS.—A recent issue of the Glasgow Geological Society's Transactions contains an interesting contribution to our knowledge of one of the Carboniferous Selachians, *Psephodus magnus*, Agass., by Dr. R. H. Traquair, F.R.S. Slowly, yet surely, the progress of palæontological research is tending to reduce the number of provisional names with which the difficult study of fossil relics is necessarily encumbered, and the present paper is one more instalment towards bringing about this very desirable result. After reviewing the work of previous writers on the subject, the author proceeds to describe a remarkable specimen from a shaly bed in the Carboniferous Limestone Series of East Kilbride, Lanarkshire, which not only exhibits two large teeth of the kind named *Psephodus magnus*, by Agassiz, but also shows forty-four others in intimate association, with portions of the cephalic cartilage and jaws, and the more or less obscure remains of a series of vertebral spinous processes. The dental group, undoubtedly belonging to a single mouth, comprises forms hitherto referred to no less than three genera and four species, and as the series is evidently incomplete, there may possibly have been more of these provisionally-named types. The two teeth of Agassiz' *Psephodus magnus* seem to belong respectively to the upper and lower jaws, and would thus imply the deficiency in the present example of at least two other corresponding forms: more than twelve of the smaller teeth are referable to Agassiz' *Helodus planus*, which had been previously identified with Psephodus by Captain Jones; another is probably *Helodus rudis*, McCoy; while the remainder, in advance of those just mentioned, belong to the so-called Lophodus, and were originally designated specifically by Agassiz as *L. didymus* and *L. lævissimus*. Helodus and Lophodus, therefore, can henceforth have only a "conventional existence," and the discovery of this Scotch specimen is an interesting confirmation of what had already been ascertained in regard to an allied genus, Cochliodus, from the Lower Carboniferous of the United States,—namely, the presence of small Helodus-shaped teeth on the symphysial portion of the jaw, in front of the main crushing plates, exactly as is the case in the living Port Jackson Shark (Cestracion) of the Australian Seas. (See article in these pages last December, Vol. XX. pp. 269–271.) Dr. Traquair's specimen, moreover, indicates that some of the flattened Helodoid forms were placed posteriorly,—again analogous to Cestracion; but neither the Scotch nor the American examples of Cochliodonts are sufficiently perfect to allow of a complete restoration of the dental armature of the mouth, and it will thus be necessary to remain content with these partial glimpses of the facts until further research has provided more ample materials.—*A. S. W.*

NOTES AND QUERIES.

FUNGOID DISEASE IN FISHES, &c.—In reply to the query of "Hal," p. 166, SCIENCE-GOSSIP, it may be generally insisted that fish in captivity, sooner or later, suffer; generally from sudden and injudicious changes of water, but even under the best conditions of aeration and the growth of plants they wither. Of the Axolotl (*Siren pisciformis*), the writer can offer reliable information from actual experience. In a tank holding about five gallons, situated in a cool corner of an ordinary domicile, have lived, for eight or more years, Axolotls. At the present time, the survivor (by right of age, for he cannot be less than ten years old) is perfectly happy, and growing grey in the service of admiration, fed once a week (generally Sunday morning) on strips of beef; the secret of his health and longevity is the outcome of the simple lesson which may be applied to tank management in general: *never change the water;* supply evaporation from good ponds, and regulate as far as possible the balance of animal and vegetable life. Axolotls, under such circumstances, not only escape the ravage of "fungoid growths," but encourage the development of a world of microscopic beauty, seemingly keeping the balance of life even. Except when running water or artificial aeration can be secured, fish are not desirable occupants of an aquarium; at least, they should never be included in a tank devoted to microscopic developments; and although fish in this sense are foes, it can be confidently and emphatically stated that an Axolotl in a tank of prosperous permanence not only encourages, but assists and develops an amount of microscopic life rarely seen under any other circumstances.—*E. T. D., Crouch End.*

THE MIGRATION OF SWALLOWS.—I send a short extract from the "Publisher's Circular" of June 15th, which describes an interesting experiment with a swallow:—"Last autumn a bookseller named Meyer, of Ronneburg, tied a waterproof label under the wing of a swallow which had occupied a nest at his house, and had become comparatively familiar. On it he wrote a query in German, to the effect that he wished to know where the swallow would pass the winter. The bird returned to its former nest bearing an exchange label similarly fastened, saying, in German also, 'In Florence, at Castellari's house, and I bear many salutations.'" I am not aware if it is yet known whether the swallows of one locality migrate and settle in a body in the same tropical neighbourhood? It would be highly interesting if it were possible to ascertain, by experiments similar to that made by Meyer the German bookseller, how far these birds in their migrations keep together. One can almost see in the future an "Annual Continental Bird Post," "Philosophy in Sport made Science in Earnest."—*Walter T. Cooper.*

LIASSIC FISH BED.—I shall be much obliged to Mr. A. S. Woodward if he will tell me where the liassic fish bed, mentioned by him in his article on "Fossil Sharks and Rays," is to be found at Lyme Regis, and also how it can be identified.—*H. P. Dodridge.*

CONTEST BETWEEN PARTRIDGE AND WEASEL.—An extraordinary attack by a weasel upon a partridge was witnessed by a ploughman last week at Kidmore End, Oxon. The man hearing a noise overhead, looked up and saw a fierce struggle going on in *mid air* between the bird and its foe. The partridge was endeavouring to beat off the weasel with its wings, whilst the weasel, finding itself off terra firma, had evidently lost its head for fighting, and its struggles seemed centred in retaining its hold upon the bird. After several minutes the partridge, not succeeding in dislodging the enemy, which "clung like grim death," became so exhausted that the pair fell together in a piece of wheat, but neither of them could be found. The partridge being a hen bird was doubtless surprised by the weasel when sitting on her eggs, and aided by fear had struggled into the air accompanied by her relentless foe.—*Frank Tufnail.*

MISS M. JACKSON would like to know if it is a common thing to find the bugle (*Ajuga reptans*) of a white colour, as she has found a white specimen.

TREATMENT OF CANARY.—I have a canary (*Fringilla canaria*), which, from the peculiar motion of turning his head from side to side with great rapidity, is apparently suffering from a severe nervous attack, brought about, I fear, by the intrusion of a mouse into the cage in the early winter. The bird manifests considerable uneasiness, accompanied with loss of voice. In addition, although the moulting period has passed, there remains a bare patch in the region of the throat, which may perhaps account for the absent notes. Can any of the readers of SCIENCE-GOSSIP kindly explain the nature of the disease, and remedies to be applied? I can glean nothing in "Bechstein" applicable to the case.—*W. W. Ingall.*

BEES AND THE COLOURS OF FLOWERS.—I remember spending nearly the whole of a summer afternoon investigating the movements of humble bees searching for honey, in a field crowded with many kinds of flowers, and coming to the conclusion, that they had no power to discriminate between one colour and another. The field was alive with bees. I watched an individual from flower to flower till I lost him, then followed another in the same way, and so on for the rest of the afternoon. Of course, with few exceptions, each bee restricted himself to the flowers of some particular species. However, it would frequently happen that a bee would make a mistake and alight for a few seconds on a different species from that to which he was devoting his energies, and then, after inserting his proboscis, would find out his error and dart off at once to rectify it. What struck me, in nearly all these cases, was that the flower inadvertently visited was of a colour perfectly unlike that of the flower sought. A bee, for instance, which was gathering exclusively from knautia, made no less than half-a-dozen ineffectual attacks on Hypochœris, thus repeatedly mistaking a light yellow flower for a lilac one. Another, whose legitimate business was with one of the yellow composites, was prone to light on the magenta heads of a plant of the same order (*Centaurea nigra*). A third bee, occupying himself with white clover, was deceived by the golden blossoms of the bird's-foot trefoil. The hive bees as a rule made fewer mistakes than the humble. I noticed a rather singular exception to the common rule, in the behaviour of one red-tailed humble bee which I watched for about half an hour. This bee confined his attentions, in a most precise manner, not indeed to one species, but to two: the common centaury and bird's-foot trefoil. Here pink and yellow were favoured equally (for I think the one was visited as often as the other), but then the shapes of these flowers were as different as their colours, and even the operation of getting the honey—the point of principal importance to the bee, no doubt—must have considerably differed in the two cases. Indeed, I could tell at any moment with eyes shut whether he was occupied just then with centaury or trefoil, for in extracting honey from the centaury he invariably uttered a sharp shrill buzz, as though testifying against some obstruction, whereas the trefoil was always rifled in solemn silence. This apparent departure from ordinary bee-principles was, therefore, quite deliberate. Is any scientific sanction to be found for it?—*C. B. Moffat.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

J. W. BAYLIS.—Use, for drying, porous, botanical paper made by Spicer Bros., New Bridge Street, Blackfriars. Dry thoroughly, changing papers daily just at first, for three weeks. Mounting &c. are subsequent processes.

MISS M. JACKSON.—A white variety of *Ajuga reptans* has been noticed more than once in SCIENCE-GOSSIP.

R. P.—In Mr. Darwin's "Cross- and Self-Fertilisation of Plants," the making of holes in the corolla of Antirrhinum by bees is mentioned. Thanks for your note upon it.

W. G. W.—Yours is not an exchange.

F. H. A.—Your specimen seems to be *Sedum Anglicum*, bu without the colour shown in the "English Botany." Notice the leaves gibbous below.

L. N.—No signs of life were perceived in your honey-grub.

R. L. H.—The supposed Ustilago "is *Urocystis pompholygodes*, not uncommon on the Ranunculaceæ." The second object you sent is a "Fungus—a Polyactis—probably *P. vulgaris*."

A. DOWNES.—"This is a fungus, one of the Myxogastres, perhaps *Licea fragiformis*."

M. K.—Yours received with thanks.

C. W. H.—Write to the Scottish Marine Station, Granton, Edinburgh, for price list of specimens, or other information.

G. E. EAST, JUN.—"The Journal of Science," 1s. 6d. monthly, 3 Horse-shoe Court, Ludgate Hill; "Science," The Science Company, publishers, Cambridge, Mass., 15 cents, weekly; "Geology of Suffolk," by Dr. Taylor, may be found in White's Suffolk Directory, &c. (W. White, Hoole's Chambers, Bank Street, Sheffield).

E. WADE WILTON.—Yours is not an exchauge.

EXCHANGES.

GOOD botanical, histological, crystals, polariscopic, diatoms, fish scales and miscellaneous microscopic slides for others as good of bacilli, entozoa, algæ, desmids, zoophytes, rocks, fossil woods.—B. Wells, Dalmain Road, Forest Hill.

WANTED, Sir Charles Lyell's "Principles of Geology," tenth edition, and SCIENCE-GOSSIP, to value; and will give in exchange the "Imperial Gazetteer: a General Dictionary of Geography, Physical, Political, Statistical, and Descriptive, with a Supplement bringing the Geographical Information down to the Latest Dates," edited by W. G. Blackie, Ph.D., F.R.G.S., in two vols.—James Meek, 7 Rosebank Road, Dundee.

WHAT offers for SCIENCE-GOSSIP, Nos. 229 to 241, inclusive, unbound?—Frank Rayner, Sherwood, Nottingham.

FORAMINIFERA, *Haliphysema Tumanowiczii*, for any other rare species.—F. W. Millett, Marazion, Cornwall.

CABINET, suitable for butterflies, micro objects, &c , exchange injected micro objects.—S., 20 Montpelier Road, Highgate.

WANTED, a quantity of insects (in spirit), foraminifera, botanical specimens, and specimens of horn and hoof for section cutting, parasites, eggs of insects, &c.; good exchange given in well-mounted micro slides.—C. Collins, Bristol House, Harlesden, N.W.

FOR exchange, 50 kite's eggs, roller's, raven's, and others. Wanted, kestrel's, long-eared owl's, snipe's, redpole's, ringed plover's, woodcock's, and other commoner species.—W. Raine, Studley Terrace, New Leeds, Leeds.

STRONG tricycle, telescoping axle, in good condition, with all accessories, offered for microscope or botanical works.—J. Hamson, 19 Victoria Road, Bedford.

WANTED, any odd publications (geological) with figures of fossils in them; write stating requirement; also any odd numbers of the "Proceedings" of the Geologists' Association of volumes vii. and viii.—George E. East, jun., 241 Evering Road, Upper Clapton, E.

"SYSTEM of the World," "Phenomena of the Solar System," "Architecture of the Heavens," "Planet Neptune," "On the Solar System," all Nicol's; Kolliker's "Manual of Human Histology;" "Polynesian Mythology," Sir G. Grey; Hodder's "Memoirs of My Time;" Heath's "English Peasantry;" Aitkins's "Annals of George III.;" Nolan's "History of the War against Russia," 2 vols.; H. Clarke's "History of the War," 2 vols.; also some proof engravings; offered in exchange for best micro objective, $\frac{1}{8}$ in.; Prescot's "Conquest of Mexico," original edition; entomological works or other acceptable matter. Ant lion, *Myrmetion*, larva; few specimens wanted in exchange.—M. L. Sykes, 1 Seedley Road, Pendleton, Manchester.

Pisidium roseum, Paludina contecta, Helix lamellata, and other local species; in exchange for *Acme vertigo, Succinea oblonga*, or well-marked varieties.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

EXOTIC butterflies, numerous duplicates: *Orn. Brookiana, Richmondii, minos, Papilio Paris, polyctor, philoxenus, protenor, Urania rhypheus, Morpho amathonte*, &c.; also wings of brilliant species.—Hudson, Railway Terrace, Cross Lane, Manchester.

I WILL exchange red crag fossils for any others.—H. P. Dodridge, 7 Baker Street, W.C.

FOR exchange, geological specimens; botanical or geological cabinet wanted.—P., 4 Merridale Lane, Wolverhampton.

STAMP and crest album offered in exchange for any geological publications with plates or woodcuts of fossils in them from the Eocene formations.—George E. East, jun., 241 Evering Road, Upper Clapton, E.

THREE large store boxes, containing upwards of 200 species of Lepidoptera; will exchange for books on chemistry, geology, physics, &c. Full particulars from—C. H. Ireland, 107 Bignor Street, Cheetham, Manchester.

HERBARIUM of upwards of 500 British plants, many rare species, beautifully preserved and mounted, to exchange for good 3 in. and 4 in. objectives and nose-piece for microscope.—Erica, 71 High Street, Banbury.

OFFERED, rhætic fossils from Aust Cliff, small teeth, coprolites, &c, in exchange for foreign recent shells, or good fossils not in collection.—F. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

OFFERED, several years' SCIENCE-GOSSIP in exchange for valuable foreign shells or offers.—F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

WILL give Woodward's "Geology of England and Wales," Taylor's "The Aquarium," and Adams's "Collector's Manual of British Land and Freshwater Shells," for one of Elcock's type slides of foraminifera (50 species), or 2 dozen slides of forams. (single species on each slide), or good books on foraminifera.—Edward Halkyard, Knutsford, Cheshire.

SHELLS for exchange: *Paludina vivipara, Planorbis lineatus, Limnæa auricularia, Limax lævis, Zon. glaber, Zon. radiatulus, V. antivertigo*, and many others. Desiderata, other shells, British eggs, or parts of last edition of "Yarrell's British Birds."—F. Fenn, 20 Woodstock Road, Bedford Park, Chiswick, W.

Wanted, eggs of long-tailed tit, cole tit, bearded tit, crested tit, grey wagtail, woodlark, wryneck, creeper, nuthatch, red-winged starling, spotted flycatcher, and red-backed shrike. Desiderata, can give eggs of *U. gullimote*, herring gull, black-headed gull, kittiwake, coot, rook, ringdove, lapwing, and partridge.—J. R. Murray, 10 St. Paul's Street, Aberdeen.

SCIENCE-GOSSIP for 1878 and 1879, in numbers, for British birds' eggs (side-blown, one hole), butterflies or moths, or offers.—F. J. Kasell, 9 Raglan Street, Peas Hill Road, Nottingham.

EGGS.—Wanted a good, strong, perfect, and light trout rod, in good condition, with approval, in exchange for 179 perfect birds' eggs, only 29 common, including shrike 9, wagtail 5, reed warbler 11, rush lark 9, ringdove 4, crow 5, waterhen 6, plover 2, stonechat 8, redstart 3. Almost all the rare eggs have more than two. List sent. Address by letter only J. F., Lyndhurst Villas, Grimsby. Enclose stamp for reply.

WANTED botanical cabinet. Offered—large entomological corked box, with a few lepidoptera, small corked box, gilt pins of various sizes, gauze net, lantern, larva box, &c. State size of cabinet.—J. W. Baylis, 56 Vine Street, Liverpool.

NESTS and eggs with full data of lesser redpole, yellow wagtail, whinchat, meadow pipit, also clutches of several others. Wanted, nests and eggs of ring ouzle, stonechat, rock pipit, lesser whitethroat, woodlark, &c.—Thos. H. Hedworth, Dunston-on-Tyne.

OFFERED—clutches of sp. hawk, dipper, reed bunting, swift, ringed plover, oyster-catcher, heron, snipe, swan, little grebe, cormorant, shag, kittiwake, lesser and greater black-backed and herring gulls, Richardson's skua. Eggs of chough, long-eared owl, stonechat, gold crest, rock pipit, bullfinch, hooded crow, nightjar, woodcock, guillemot, razor-bill, gannet, shearwater, storm petrel. Wanted complete clutches only.—R. J. Ussher, Cappagh, Lismore.

WANTED, members for Entomological Evercirculator. Address for particulars, Mr. T. F. Uttley, 17 Brasenose Street, Albert Square, Manchester.

BOOKS, ETC., RECEIVED.

"Official Year Book of the Scientific and Learned Societies of Great Britain and Ireland." (Charles Griffin & Co.).—"A Manual of Health Science," Andrew Wilson, F.R.S.E. (Longmans).—"Birds of Lancashire," by F. S. Mitchell (Van Voorst)—"The Copper bearing Rocks of Lake Superior," by Roland Duer Irving (U. S. Ceol. Survey).—"Walks in Epping Forest," by Percy Lindley (123-5 Fleet Street)—"Annual Report of Hackney Micro. & Nat. Hist. Soc.,"—"Proceedings of the Academy of Natural Sciences of Philadelphia."—"Ben Brierley's Journal."—"Botanical Gazette."—"15th Annual Report of the Wellington College Natural Science Society."—"On the Granite and Schistose Rocks of N. Donegal," by Dr. C. Callaway.—"A Plea for Comparative Lithology," by Dr. C. Callaway.—"Journal of New York Microscopical Society."—"The Naturalist."—"Ocean and Air Currents," by T. D. Smellie.—"American Monthly Microscopical Journal."—"Feuille des Jeunes Naturalistes."—"Proceedings of the Liverpool Naturalists' Field Club," 1884-5.—"The Mersey Tunnel, its Geological Aspects and Results," by T. Mellard Reade, F.G.S.—"The Periodical Cicada," by C. V. Riley.—"Cosmos"—"The American Naturalist."—"The Medico-legal Journal," New York.—"Journal of the Royal Microscopical Society."—"Science."

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—J. P.—T. H. H.—C. C.—T. S.—P. S.—F. W. M.—E. A. F.—W. W.—W. E. B.—C. B. H.—E. J. E.—G. D.—J. P.—W. R.—F. T.—J. S.—G. E. E., jun.—F. H. A.—J. W.—C. C. D.—R. L. H.—E. H. R.—J. W. B.—R. H.—J. M.—F. R.—L. N.—A. J. W.—F. H. A.—J. H.—H. G. F.—S. & S.—T. D. A. C.—B. H.—A. W. jun.—C. B. M.—F. R.—C. W. H.—P. Q. Z.—J. R.—W. G. W.—J. W. G.—M. L. S.—R. P.—G. F. B.—V. G.—J. B.—G.—J. B.—T. F. U.—F. H.—J. H.—E. H.—F. G. F.—R. J. U.—E. W. W.—F. J. R.—C. R.—E. A. W.—C. H. I.—J. F.—W. T. C.—H. P. D.—J. R. M.—A. E. P.—J. R. M.—S. C. C.—H. & . &c.

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Vincent Brooks Day & Son, Lith

GROUP OF FORAMINIFERA.

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GRAPHIC MICROSCOPY.

By E. T. DRAPER.

No. XXI.—Group of Foraminifera.

APPROACHING the lowest forms of animal life, the Foraminifera, of the class Rhizopoda, is an order of considerable importance. The typical animal consists merely of a tubulous or perforated shell, in some species of most elaborate configuration; or an aggregation of silicious particles, enclosing and invested by a living substance. Simple as these animals may appear, they have claimed the attention of the most distinguished naturalists, from the fact that their imperishable remains constitute the greater part of the solids of the sedimentary strata of the earth, the chalk formations in particular.

The shells and tests are familiarly known to microscopists, the former especially, and very few cabinets are without these popular slides. Even if space admitted, elaborate description would be unnecessary. The literature of the subject may be found in the writings of D'Orbigny in 1826, Dujardin in 1835, and in numerous memoirs. Most works on the microscope, touching on minute forms of animal life, contain a description, and Dr. Carpenter, the greatest authority, summarizes the subject in the article "Foraminifera," in the present issue of the Encyclopædia Britannica.

In reference to the plate representing specimens of the shell-type, drawn in relative proportion, and found together in the same field of view, it may be generally stated that there are two distinctive types of foraminiferous shells, the porcellaneous and vitreous, easily detectable under microscopical power, the one series white and imperforate (Miliolidæ), the shell being more or less spiral, made up of a series of half turns; the other Silicious, or perforate, in which the forms are much more varied. Beyond these groups is a sub-division of the order, the Arenaceous, not so frequently found as cabinet specimens, but as microscopic objects of great interest, where a "shell," in its popular sense, is entirely absent, the creature building up, and holding together by its own bodily substance, a nest, or compacted mass of the minutest particles of sand.

Dujardin's description in 1835, as to the general character of the animality of the foraminifera could not have been firmly established—forms were numerous, but examination required high microscopical power, to establish their classification with the sub-kingdom protozoa, and to reveal the character of that vital translucent substance, capable of extreme attennuation, retraction, self-division and fusion, then termed "sarcode."

The foraminifera, in their most attractive forms, are microscopic. It would be difficult, without the aid of the instrument, to convey an idea of the elegance of their configuration or their wonderful constructive power, where carbonates and silicates are moulded into shapes and symmetries curiously diverse, by atoms of glairy plasma, thus secreting a poriferous shell, and pouring itself out in sensitive filaments; this is the ordinary form; but in the Arenaceous group the slimy life aggregates together the minutest granules of sand, cementing and holding them by an investment of the living principle. These Arenaceous "tests," appearing like minute seeds delicately formed of grains, are curiously interesting; globular specimens are seen in rows, on filamentous threads of algæ or sponges, sometimes in the form of compacted hard thin rinds, made up of grains of all angles fitted together with curious exactitude, leaving interstices through which pseudopodia emerge; these conditions are rarely to

be purchased as "slides"—being "recent," they can only be obtained from dredged algæ, and require the closest searching; frequently amidst the built up atoms of these "tests" are particles of brilliant colour, aiding the general elegance of the object. Many, loosely compacted, have no definite surface, others, apparently more solid, when fractured and the interior revealed, appear under the microscope as *nests of stones*, cemented with the precision of mosaic work; various substances are frequently intermixed, curious sponge spicules, and fragments of the dead shells of their relations, may be found imbedded in the general mass.

Fossil remains are abundant, and in immense profusion, in the sedimentary strata, calcareous rocks, limestones, many of the clays, and notably in the chalk; the dust falling from the fracture of a minute piece may contain countless specimens. Curious and somewhat hypothetical calculations of numbers have been attempted. A reliable authority states that a cubic inch of limestone imbeds fifty-eight thousand of these shells, and that in the stones of Paris the miliolidæ are so abundant that the city may be said to be built by them.

Recent dead specimens may be sifted from the ridges of sand left by tides, in a living state on deep-sea algæ; and dust from a case of freshly imported sponges is most prolific. This débris, gently scattered over a basin of cold water, will cause a separation, the sand sinking; the light shells, floating, may then be skimmed off, carefully dried, and mounted.

Crouch End.

A SEPTEMBER PLANT-HUNT IN SOMERSET AND DEVONSHIRE.

IN the matter of numbers we were more successful than last September, finding about one hundred and ten species of flowering plants and ferns, together with a few microscopic fungi. At Bath, out of four species of micro-fungi that we found, two are not mentioned in this journal in "Micro-fungi Bathonienses," by C. F. W. T. Williams. These are *Puccinia circeæ* on enchanter's nightshade, and *Triphragmium ulmariæ* on meadow-sweet, both in a meadow near Freshford. Apropos of Triphragmium, this species seems always to be rather local in its habits; in districts where *Spiræa ulmaria* abounds it frequently infects only one patch of this plant. The other fungi found were *Urocystis pompolygodes* and the ubiquitous *Æcidium Tussilaginis.* In flowering plants we found *Alchemilla vulgaris* at Freshford, not noticed elsewhere in our tour; *Euphorbia amygdaloides*, *Epipactis latifolia* (probably var. *purpurata*), *Inula conyza*, *Malva moschata*, *Symphytum officinale* (purple and white), *Tanacetum vulgare*, *Valerianella dentata*, &c., and I have received specimens of *Atropa Belladonna* and *Daphne laureola* from an inhabitant. Professor Babington has published a Flora of Bath.

At Shepton Mallet, our next stopping-place, we were in the home of the rusty-back (*Ceterach officinarum*) which luxuriates in every old wall, and here we also found abundance of *Asplenium ruta-muraria*, *A. trichomanes*, fine specimens of *Scolopendrium vulgare*, and a plant of *Polypodium vulgare*, with the pinnæ deeply serrate. In the Phanerogams, *Campanula latifolia*, *C. trachelium*, *Colchicum autumnale*, both lilac and white varieties equally abundant, *Cotyledon umbilicus*, *Sedum telephium* and another sedum not in flower (*? rupestre*).

Fungi: *Phragmidium obtusum*, *Puccinia violarum*, a rust covering the leaves of *Arctium lappa*, and others not identified.

Though a convenient centre for excursions, Shepton is not overrun by holiday-makers. Thus a tourist there once asked a native what were the principal lions of the place. "Red Lion and White Lion, sir," was the reply.

We visited the Cheddar Cliffs, and of course did not fail to spot *Dianthus cæsius*, though luckily most of it is out of reach. Why it grows in such abundance on these cliffs and nowhere else in England, when there are similar rocks at Ebbor, and other places in the vicinity, where it might equally well grow, is one of those mysteries so difficult to explain. *Thalictrum minus*, which also abounds, is known locally as the "Cheddur furn" (Cheddar fern). Farther up the gorge we find *Polypodium Robertianum*, and, on turning up to the top of the cliffs, *Epipactis latifolia* in a plantation, *Gentiana amarella* on the exposed ground at the top.

Glastonbury need only be mentioned, as the celebrated "Thorn" is already known to the readers of SCIENCE-GOSSIP. Curiously there is nearly the same legend at Mentone. A visitor going into one of the houses is said to have stuck his walking-stick in the ground and forgotten it, and the stick sprouted and is now still growing in one of the places. By-the-way, some plants seem to grow and flourish in one's flower press. I gathered some *Sedum telephium* and left it exposed in the open air to dry till the leaves became flaccid, then laid it in the press and changed the papers once or twice. About a fortnight later at Clovelly, I found white shoots 1½ inch long sprouting from txhe ails of the dessicated leaves, with tiny leaflets on them, and when placed in my water jug for a day or two, they increased considerably in size and began to turn green. And a plant of *Cotyledon umbilicus* threw up a tiny white leaf in the press; it is now living in our garden, though the mice have bitten it down once or twice.

Another day we took the train to Masbury and walked to the Roman Camp at the top of the Mendips. On the neighbouring ground grew *Athyrium filix-fœmina*, *Blechnum spicans*, *Digitalis*

purpurea, *Erica cinerea*, *Euphrasia officinalis*, *Lastrea dilatata*, *L. filix-mas*, *Polygala vulgaris* (white), *Potentilla tormentilla*, *Rubus Idæus*, &c. In some meadows a little lower down, *Scabiosa succisa* (white var. among them), *Rhinanthus crista-galli*. We got down into Ham Wood, which extends for a mile or two down a lovely ravine, here we found *Epilobium angustifolium*, *Chrysosplenium oppositifolium*, *Cystopteris fragilis* (very fine), *Polygonatum multiflorum*, *Paris quadrifolia* (and, as usual, a specimen with five leaves), *Allium ursinum*, *Dipsacus pilosus*, *Hypericum hirsutum*, the lilac and white vars. of *Colchicum autumnale*. We also found a most curious frond of *Scolopendrium vulgare*, somewhat like one figured in SCIENCE-GOSSIP in 1879, but different. The midrib is not more than ⅜ in. long, and the leaf forms two curved uniform lobes on either side of it, but the midrib is not bifid as in the figure alluded to and the lobes curl round a great deal more. Only one frond was like this, but the others on the same plant were very curious. In the adjoining cliff woods grew *Malva moschata*, *Daphne laureola*, *Asplenium Adiantum-nigrum*, and near here a solitary cowslip was still flowering in a field. As we approached Shepton we came to a wall decked with evergreen alkanet (*Anchusa sempervirens*).

From Shepton Mallet to Taunton the train passes through uninteresting scenery, but thence to Minehead, and on by coach to Porlock, the country is hilly and pretty. Round Porlock the pine woods are carpeted with ferns, the sheep's bit (*Jasione montana*) and *Melampyrum pratense* peeping above them, and the rampant fumitory (*Fumaria capreolata*) appearing in places. A salt marsh by the sea seemed to contain nothing botanical. Climbing Porlock Hill, we found *Sedum album* and *S. dasyphyllum* in the walls. Soon we emerge on open heath, purple with *Erica cinerea*, and *Calluna vulgaris*, interspersed with gorse. *E. tetralix* was very sparingly distributed, as were the whortleberry (*Vaccinium myrtillus*), and such ferns as *Lastrea dilatata*, *Blechnum spicans*. Exmoor has been characterised as a "bit of Scotland dropped down in Devonshire," and as we tramped along the road a truly Scotch mist blew over us, which ever and anon was dispersed by the sun, forming rainbows at our feet where the hills sloped down seaward, and as we approached Lynmouth the weather cleared up.

It were impossible to describe one-tenth of the rambles that could be taken round this lovely spot, we can therefore only mention those in which there is most to be found. Leaving the Lyndale Hotel, we follow up the Lyn Valley, and, among the *Cotyledon umbilicus* filling every hole in the walls, find some specimens of the var. *foliosa*, in which the transition from peltate radical leaves to spathulate leaves on the stem is well seen, many intermediate forms of leaf being present on some plants. Keeping up the road we find good specimens of *Asplenium Adiantum-nigrum* among the rocks, and a patch of *Sedum rupestre* in fruit, some of this also appeared to grow a little in my flower press; also a plant of *Artemisia absynthium*. On arriving at Watersmeet, where two valleys join, we take a path down to the torrent and find *Hypericum Androsæmum*, *Sanicula Europæa*, *Lastrea oreopteris*, and two micro-fungi, *Phragmidium gracile*, *Puccinia circææ*. Had we followed up the path through the woods, along the left bank, we should have found *Chrysosplenium oppositifolium*, *Euphorbia amygdaloides*, *Angelica sylvestris*, and our "nine lived" friend the *Sedum telephium*. Continuing along the left bank, we find several Compositæ, *Serratula tinctoria*, *Lactuca muralis*, *Hieracium sylvaticum*, besides the spindle-tree (*Euonymus Europæus*), and, among the luxuriant fronds of blechnum, an occasional forked one. In a clearing, we find the lovely little *Wahlenbergia hederacea*, with such an unlovely name, nestling amidst the moss. Here the silver-washed fritillary butterfly (*Argynnis paphia*) flies in and out of the underwood, anon settling on a bush and fanning its wings in the sun. We find little new of interest till we come to a bog near Bagworthy Wood, where, in the space of a few square yards, are collected together *Anagallis tenella*, *Drosera rotundifolia*, *Hydrocotyle vulgaris*, *Hypericum elodes*, *Narthecium ossifragum*, *Pedicularis palustris*, and an orchis now in fruit. From this point up to the Doone Valley, and round into the main road by Millslade, we had no particular finds, except some white heather and deep blue *Polygala vulgaris*. We saw a couple of the red deer, natives of Exmoor.

Or let us climb up to the town of Lynton, and follow along the Valley of Rocks to the coast. The rocks sloping down to the sea at this point, and the bracken and heather-covered slopes at the back, with thickly-wooded hills beyond, will compare not unfavourably with some parts of the Riviera, though the changing tints on the sea are not quite so bright as on the Mediterranean. Here I found the only specimen of *Puccinia umbilici* on *Cotyledon umbilicus*. Passing the venerable buildings of the Lee Abbey, we come to a turning down to the coast where some patches of meadow sweet are infested with *Triphragmium ulmariæ*, and, on rocks close down to the sea, find *Silene maritima*, *Cochlearia danica*, *Armeria vulgaris*, *Plantago coronopus*, *Crithmum maritimum*, and *Asplenium marinum*, the last two named being mostly out of reach. Numbers of the bristle-tail (Machilis), an insect of the order Thysanura, were playing about the rocks, looking at first sight like miniature greyish-brown prawns.

From here, on to Heddon's Mouth, we had no special finds, but the walk is splendid; the path now lying through gloomy pine woods, now bending round a ravine with a sparkling cascade, and now rounding bold headlands, from which the jagged outlines of the coast are seen fading into a blue empyrean haze in the far distance.

At Lynton we also found *Echium vulgare*, *Gera-*

nium columbinum, *Fumaria capreolata*. *Lycopodium clavatum* is said to grow on Exmoor; *Asplenium septentrionale* was once supposed to occur at Glenthorn, and I am told that *Adiantum Capillus-Veneris* ought to be found at Lynmouth somewhere. I have not heard of Hymenophyllum being found.

At Ilfracombe, *Spergularia rupestris* grows on the rocks, in company with *Plantago maritima*, *P. coronopus*, *Crithmum maritimum*, &c., these being easy of reach compared with what they were at Lynmouth.

We took the train to Morthoe and drove to the shore. Here the furze was red with *Cuscuta epithymum*; *Erythræa latifolia* was dotted about in the grass, and *Erodium maritimum* grew in company with *E. cicutarium* in the walls. Along Woolacombe Sands we noticed a curious phenomenon, probably a kind of mirage. The sands are about half a mile wide at this point, and the sun was scorching down on them, and although the tide was a good way out, yet it appeared as if about a quarter of a mile ahead the sand was covered with a layer of water about an inch or two thick, which seemed to reach close up to the shore and to be rippling. But when we advanced, we found the sand to be perfectly dry, and on looking back, the part we had traversed seemed covered with water in the same way, and some people sitting on a rock seemed to have their feet in the water.

On the sand-dunes at the back grew *Convolvulus soldanella*, *Elymus arenarius*, *Euphorbia paralias*, *Iris fœtidissima*, *Ligustrum vulgare*, *Rosa pimpinellifolia*; and *Œnothera biennis* is said to be found near here, but it was too hot to make a prolonged search. After diving inland, we again reach the shore at Croyde Bay, where we gather *Honckenya peploides*, *Aster Tripolium* (mostly discoid), *Anthyllis vulneraria*, &c., and on Saunton rocks find *Statice occidentalis* and *Matthiola sinuata*, and near, *Lycopsis arvensis*, *Saponaria officinalis*. Want of time prevented our exploring Braunton Burrows, where *Artemisia maritima*, *Asperugo procumbens*, *Chenopodium rubrum*, *Epipactis palustris*, *Erigeron acre*, *Scirpus Holoschœnus*, *Teucrium scordium*, &c., are said to be found. The burrows were planted with *Elymus arenarius*, and are aptly called the "Little Egypt." Between here and Braunton station we found a good specimen of the var. *lobatum* of *Scolopendrium vulgare*, and saw many painted-ladies (*Vanessa cardui*) flitting about.

At Clovelly we did little botanising, but *Senebiera didyma* grows between the stones in the "main street" of that quaint old village. *Epipactis latifolia* (? var. *media*) up the Hobby drive; the golden rod is lovely in the woods; *Vicia sylvatica*, and *Trifolium arvense* grow close to the shore, and *Atriplex rosea* in the stones of the beach at Mill Mouth.

Here our tour ended.

I should advise any readers who are making a similar expedition, to provide at least two flower presses for the reception of their specimens, one for the fresh plants, and one into which they could be transferred when partly dry. I much regretted the want of a second press myself. In country inns there is much difficulty in getting the papers changed or dried; in fact, for this sort of collecting, "there's no place like home."

G. H. BRYAN.

Peterhouse, Cambridge.

HAPLOGRAPHIUM: A GENUS OF FUNGI.

THIS genus of Hyphomycetes was founded by Berkeley and Broome in their "Notices of British Fungi," in the Annals and Magazine of Natural History, 1859, where they described it as follows: Flocci atri, non fasciculato-stipati, articulati. Sporæ concatenatæ, hyalinæ. They distinguished it from Graphium by the character mentioned, that the stem was single, not compounded of a number of parallel and cohering hyphæ, and pointed out that the *Graphium tenuissimum* of Corda and the *Periconia chlorocephala* of Fresenius belong to this genus, to which they also added a new species, *Haplographium delicatum*.

I had the pleasure of finding another species near Birmingham, which belongs to the same natural group, but differs in one important particular from all the three previously described. While walking in a field between Langley and Middleton, about eight miles from the town, I came upon the branch of a tree lying among the grass, where it had evidently been left undisturbed for some time till it had become thoroughly rotten. Turning this over, as my custom is, I saw that the lower surface, which was black from decay, had on one part a delicate bloom quite perceptible to the naked eye. Portions of this were secured, and, on being examined microscopically at home, the bloom was resolved into a dense forest of tiny vegetation, formed of slender, erect, straight, dark-brown stems, about a quarter of a millimetre high, each surmounted by an obovate head of a delicate pale honey-colour, which contrasted strongly with that of the stem, as seen by a half-inch objective in a brilliant light. This appearance suggested to me, as soon as I ascertained the structure of the head to be such as to ally it to these first-mentioned species, the name of *Haplographium bicolor*, as a suitable one to designate my find. Another striking point in the appearance of the fungus is that each stem is supported on a broad, dark-brown, cushion-like base, which gives it a decided look of rigidity and strength. By reflected light the brown is almost black.

The stems are simple and septate, the number of septa varying from six to nine; the upper joint is

blunt, and nearly hemispherical, and from it radiates a mass of branched threads from which the spores are produced; but as the evolution of the spores is accompanied by the excretion of a large quantity of a mucous substance, by which they are bound into a compact mass, it is impossible to see the structure of these threads until all the spores are washed away by water. The aspect of the stems, before and after the application of water, is represented under a comparatively low magnifying power in Fig 127.

Fig. 127.—*Haplographium bicolor*. × 150.

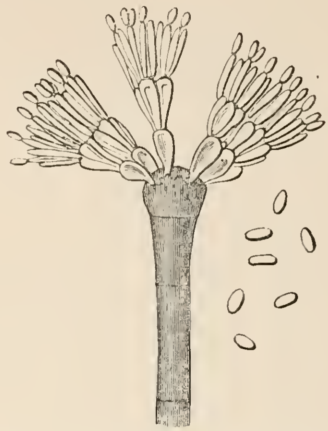

Fig. 128.—*H. bicolor;* portion of the branched head and spores. × 750.

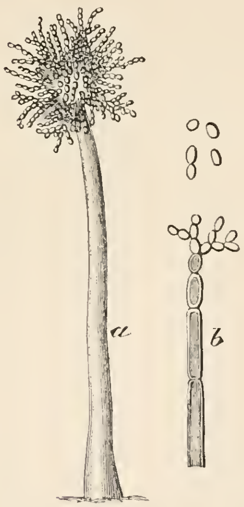

Fig. 129.—*H. chlorocephalum*. *a*, stem, × 120; *b*, summit of stem and spores, × 250.

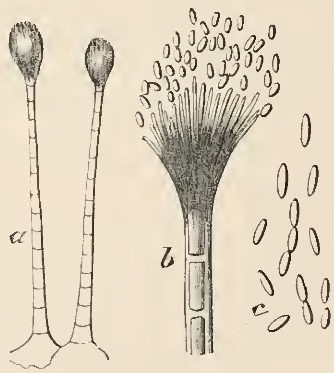

Fig. 130.—*H. tenuissimum*. *a*, two stems, × 150; *b*, head of branches; *c*, spores, × 750.

The threads which constitute the head are branched in a penicillate manner, and form, when undisturbed, an obconical or top-shaped mass; under pressure they spread out so as to radiate in all directions, and can then be seen, by a high power, to spring from a few oblong cells seated on the upper surface of the topmost cell of the stem. The further end of each of these gives rise to a cluster of branches, varying in number from two to five, each of which similarly produces in turn from two to seven ultimate basidia. From the latter the spores originate; one, two, or three spores could be seen still seated on the upper end (fig. 128). One point I could not determine, although it is important, viz.: whether the spores were produced separately from the basidia, so that as each fell off its sterigma, its place was occupied by another; or the spores successively produced remained united in a chain. At any rate, I was unable to see any spores still concatenate. The affinity, however, in other respects of my fungus with those previously enumerated renders it very probable that they were so. In conclusion I will give descriptions of the three species of Haplographium now known in addition to Berkeley and Broome's.

HAPLOGRAPHIUM, Berk. and Br. (1859).

Flocci free, septate, dark-brown, sometimes penicillately branched at the apex. Spores simple, concatenate, hyaline.

1. *H. delicatum*, B. & Br. For description and figure, see Cooke's Handbook, p. 568.

2. *H. chlorocephalum* (Fres.). *Periconia ch.*, Fresenius, Mykol. pl. 4, figs. 10–15 (1850).

Stems simple, black, shining, rigid, straight or slightly bent, gradually thickened below; head greenish; spores in dichotomous chains, oval. (Fig. 129.)

On rotting herbaceous stems, Germany, forming a greenish-black pubescence. Stems about $\frac{1}{2}$ millimetre high; spores 7–9 μ.*

3. *H. tenuissimum* (Corda), *Graphium t.*, Corda, Icones, i. fig 252 (1837).

Effused, very thin, pale fuscous; stems simple, straight, filiform, dilated at the base, brown, semi-pellucid; head subglobose, yellow, its threads straight, of the same colour, very slender; spores subacute, white. (Fig. 130).

On wood of beech, Bohemia. Height of stem about $\frac{1}{4}$ mm.; length of spores $4\frac{1}{2}$ μ.

4. *H. bicolor*, Grove.

Stems effused, gregarious, occasionally two or three connate at the base, erect, straight, rigid, blackish-brown, opaque, paler and rounded above, bulbous below; head pale, honey-coloured, obovate, the lower part composed of dense persistent radiating twice penicillately branched threads; spores oblong or ovate, hyaline, subacute. (Figs. 127 & 128.)

On rotting wood, Birmingham. Stems $\frac{1}{5}$th to $\frac{1}{3}$rd mm. high; spores 4–5 μ. long, accompanied by a mucous secretion. Approaching in some respects *Cephalotrichum curtum*, Berk. (Cooke, Handbook, p. 569), but in others differing widely. It will be seen that the structure of the head is much more complicated in this than in the other species of Haplographium, and, in fact, is almost sufficient to entitle it to rank as the type of a new sub-genus.

W. B. Grove, B.A.

Birmingham.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

The official Report of the British Association meeting at Montreal, just issued, is rather bulky, and contains much interesting matter. Among the reports on the state of Science may be specified one on a subject which needs serious attention, viz., Chemical nomenclature. The tricks that have been played, and still are being played, with chemical names, have fully constituted themselves a scientific nuisance. Thus we have—in modern text-books dating from 1860 to 1880—no less than seven names for carbonic acid, *i.e.* the following, besides the old name, carbonic anhydride, carbon anhydride, carbon dioxide, carbonic dioxide, carbon oxide, and carbonic gas. Other similarly familiar compounds are similarly disguised with or without reason, usually without. Pedantic affectation is at the bottom of it, doing "the last thing out" in science as in shirt collars. Archæologists tell us that the large families of the Browns and the Blacks and the Greys were originally named from the colour of their hair, but if a rectification of this were attempted on the original basis, how great would be the confusion! All the Blacks and all the Browns that attained a respectable old age would have to change their names to Grey. But this would have more rational justification than most of the recent changes in chemical names, as it would represent a change of fact. The tampering with chemical names is all based on mere theories, some of them very wild and ephemeral. The most absurd of these neologies is that of "anhydride," which simply means without water. Thus certain compounds of carbon, sulphur, nitrogen, &c., with oxygen, are called carbon and carbonic anhydride, sulphuric anhydride, nitric anhydride. "Carbon without water" (carbon anhydride), as used by Oding for carbonic acid, is bad enough, for if $C\,O_2$ is to be called waterless carbon, what is C, the element itself. Carbonic anhydride, sulphuric anhydride, &c., are still more atrocious; applying an adjective to qualify a negation, as though we should say yellow nothing, blue nothing, big nothing, and little nothing, sweet nothing, and sour nothing. When men take the millinery infection, and go in for the latest fashions, they are worse than women, especially men of science, who ought to know better.

After this tabular display of retrogession, it is refreshing to turn to Mr. de Rance's report of the Underground Waters Committee. This committee has been at work during twelve years, and have worked hard and well with most interesting and practically valuable results. They have collected particulars of the sections passed through by a very large number of wells and borings; a daily record has been obtained of the height at which water stands in many of these wells; investigations have been carried out as to the quantity of water held by a cubic foot of various rocks by Mr. Wethered; and as to the filtering power of sandstones, and the influence of barometric pressure and lunar changes on the height of underground waters, by Mr. J. Roberts. During the year the attention of the committee has been directed to the remarkable influence of the earthquake which visited the east and east-central counties of England, in March last, in raising the levels of the water in the wells of Colchester and elsewhere. They are still at work, and seeking more detailed information as to the proportion of actual rainfall absorbed by various soils, over extended periods representing typical dry and wet years; and

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* It may be as well to repeat, for the benefit of those not familiar with the mode of measuring microscopic objects now becoming almost universal, and which should be quite universal, that the unit (called a micromillimetre or micron, and represented by μ, *mk.* or *mmm.*) is $\frac{1}{1000}$ of a millimetre or about $\frac{1}{25400}$ of an inch. Any one, then, who can place his microscope so as to magnify 254 times, and divide an inch into 100 parts, can measure objects by this unit.

invite Canada and the United States to do for their respective countries what this Committee has done and is doing in the British Isles.

I am very cautious in advocating Government endowment of scientific research, knowing how liable it is to abuse, and firmly believing that scientific poverty is preferable to questionably gotten scientific wealth; but here is a case where the physical welfare and, I may add as a clencher, even the ultra-sacred pockets of the whole community is concerned. We are paying exorbitantly for polluted surface water, imperfectly filtered by pettyfogging artificial filter-beds, while under our feet are vast supplies of nature-filtered water. The primary questions as to the quantity and distribution of this water, and its practical availability for our sore requirements, can only be determined by such work, and is being done by this committee; therefore, say I, this committee, justly regarded, is a national institution, like the army and navy, and should be supported accordingly.

The Boulder Committee still continues adding to the details of its curious history of the resting places, dimensions, and composition of wandering blocks of stone. There is one element of cruelty in their proceedings. They are cutting and maiming and murdering the old traditions concerning the giants who carried these stones about, and even damaging the Druids. There is an interesting element of observation in some of these fables. When living at Caergwrle, in Flintshire, I amused myself by studying the glaciation of the district, and succeeded in tracing the limits of a very large glacier, which (in a paper read at the British Association, 1865) I named the Alyn Glacier, as its boundaries were clearly determined by the same general configuration which determines the curious course of the Alyn river. Among the glacier vestiges is a very large boulder, near the Padeswood station of the Chester and Mold Railway, which bears the name of the "Garreglwyd," or Grey Stone, and gives its name to the farm on which it stands. Another similar stone of smaller size is near to it. Formerly the high-road to Chester passed between these stones, and the tradition states that a Welsh giant, jealous of the growth of Chester, carried these with malignant intent towards it; but, growing tired, dropped them, one on each side of the road. He is said to have brought them from Moel Fammar. They are deeply embedded in soil of glacial origin, overlying carboniferous strata, but are themselves of millstone grit. Moel Fammar is of millstone grit, and eight or nine miles distant. The tradition, therefore, recognises the difference between these and the local sandstones, though my own study of the glaciation connects them with another mass of millstone grit, the Hope Mountain.

On the 20th of June M. Gaston Tissandier made a balloon trip from Paris to Rheims, in the course of which he obtained 24 instantaneous photographs of the country below him. If successful, they must be interesting, but I have not yet met with any account of their publication. The development of aeronautical photography has considerable scientific interest. Besides supplying us with actual bird's-eye views of known country, with interesting effects of radial perspective, it will probably be useful hereafter in geographical exploration, an application of ballooning that I have frequently advocated, and believe will be very successfully used when we have so far perfected the fabric and varnish of the body of the balloon as to prevent the exosmosis of the gas, which now limits the period of possible flotation of the machine to only a few hours. With this one defect remedied, and the waste of ballast obviated by the use of the drag rope, days may replace hours in balloon voyages, especially within the Arctic Circle, where the summer daylight is continuous.

A correspondent writing from Kashmir (G.M.G.), asks why corrections for temperature are added to the tables for determining elevations above the sea by observations on the boiling point of water. In reply, I ask him to consider why water boils at a lower and lower temperature as we ascend. He will easily understand that this is due to diminished atmospheric pressure, and that this diminution of pressure is a consequence of our leaving below us a larger and larger fraction of the whole atmosphere as we rise higher and higher. But the quantity thus left below for every hundred feet (or other unit) of ascent must depend upon its density: this density diminishes as the temperature of the air increases, and therefore if he climbs 100 feet on the hill side, from the valley of Kashmir, in the midst of air at 80° Fahr., he will have left less air below him than I should leave behind me in climbing 100 feet from a starting point of similar elevation on the side of Snowdon, in the midst of air at a temperature of 50°. Or, otherwise stated, his atmosphere at Kashmir, being warmer than ours here, is proportionally taller, pressure at base being the same. The same correction for temperature is of course required in measuring heights by means of the barometer.

In my last month's gossip I referred to Professor Langley's lecture at the Royal Institution, and attributed his startling conclusion concerning the effect of solar radiation on a planet unprotected by atmospheric resistance to a verbal ambiguity in the report of the lecture, but now find that I was mistaken; that Professor Langley really does mean that such direct unimpeded radiation would fail to warm the surface of such a planet up to the freezing point of mercury. I learn this from the quarto volume describing his "Researches on Solar Heat, and its Absorption by the Earth's Atmosphere," which he has kindly sent me. In spite of my great respect for Professor Langley and his valuable work, I am satisfied that he is wrong on this point, though probably right as regards his high valuation of the solar

constant. The subject is discussed in my Science Notes in the "Gentleman's Magazine" of this month.

In reference to Professor Langley's volume above named, it may be interesting to the readers of SCIENCE-GOSSIP to learn that it is published as No. 15 of the "Professional Papers of the Signal Service," under the authority of the Secretary of War, by the War Department of the United States Government, and that these Signal Service volumes form only one of a series of purely scientific works issued from the Government Printing Office at Washington. They are all beautifully printed on excellent paper, and abundantly illustrated with engravings, and are gratuitously distributed, post free, to Englishmen who, like myself, are known to be students of the subjects they include. Every time I receive one of these volumes (and I have received a large number), I blush with shame at the contemptible higgling of our own Government in the publication of such papers as the Reports of *The Challenger* Expedition, which, after a pitiful delay, are at last issued at a price that any private publisher would regard as grossly extortionate. There was no lack of liberality in fitting out the expedition, and providing snug berths and luxurious free yachting appliances for certain privileged gentlemen, but immediately the general interests of science and those of the whole nation are concerned in their publication an extravagance of economy is displayed.

Dr. Keegan writes as follows: "I am glad to find (p. 151 of July number) that Mr. W. Mattieu Williams disclaims any desire to see literature excluded from the curriculum of modern education. I am sorry that my remarks were misunderstood; but I am firmly convinced that studies and intellectual pursuits that fail to adequately awaken in man "the sublime consciousness of his own humanity," are defective as educational engines. I quite agree with Mr. Williams as to the superiority of the Greek ideal of life and actual civilisation as embodied in the sublime literature of that remarkable people; and I am disposed to think that the old Roman literature was so far influenced thereby that it was not really national, strictly speaking. Its being more nearly allied to modern tongues, and its acquirement being rather the superior as an intellectual exercise, are probably the chief reasons why it is more deeply studied than the Greek. With regard to "monkish inheritance," many people nowadays are beginning to opine that those old ecclesiastics were not altogether "ignorant of everything but the language of the Church." We might even hazard a surmise that some of them would turn in their graves if they became cognizant of sundry matters and proceedings of recent date relative to our universities and seminaries of learning. For it would seem that the study of material science, with a view to the propagation of the industrial arts, threatens, in this terrifically enlightened nineteeth century, to eclipse culture in a broad and liberal sense."—P. Q. KEEGAN, LL.D.

It is evident enough that we are perfectly agreed concerning the educational object to be attained, we differ however very widely as regards the means. I have struggled very hard to discover when and where "the sublime consciousness of his own humanity" comes into the soul of a boy while he is struggling with the declensions of Latin nouns and the irregularities of Greek verbs, or during any part of the years which he occupies in qualifying himself to write bad Latin prose, and still worse Latin verse. Or supposing that by sacrificing the most precious period of his intellectual development he attains sufficient vernacular intimacy with Latin and Greek to be able to appreciate their untranslatable peculiarities, I cannot understand how such profound intimacy with the unspeakable obscenities of the Pagan mythology can operate otherwise than injuriously upon his moral growth. It must be remembered that besides the books which, like Ovid's Metamorphoses, are devoted exclusively to telling the details of the foul fables, the whole of the classic literature (excluding the mathematics and philosophy of the Greek scientists) is pestiferously saturated with allusions to the dirty doings of Jupiter and his very immoral Olympian associates.

What a ballad of butchery is Homer's Iliad! What mean-spirited braggart bullies are his heroes! who taunt and torture their fallen dying foes with malignant insults. Granted that this is historically correct, that the warriors of ancient Greece were habitually addicted to practices that the lowest of modern prize-fighters would scorn to imitate, this is no excuse for teaching boys to admire them. Bill Sykes is presented by Dickens to his readers as a repulsive vulgar brute. Achilles is presented by Homer as a hero with supernatural endowments and semi-divine pedigree, and all his brutalities, including the disgusting treatment of the dead body of Hector, are so effectively blazoned forth in poetic glamour and admiration as to utterly pervert the natural moral sense of the majority of the students of the Iliad—so much so that they will probably denounce as rank sacrilege my present common-sense view of the true character of the son of Thetis, the beloved of the gods.

I freely admit that the teaching of physical science by rote, the mere grinding of mathematical conundrums; training young men to formulate instead of exercising their reasoning faculties, and, still worse, leading them to believe that such mechanical formulating actually is reasoning, deserve all the condemnation they have received. Properly taught science presents to the young mind the sublimest of poetry, and carried upwards, as it should be, from physical to social and moral science, it truly and soundly awakens the sublimest attainable consciousness of our own humanity, and our relations to the divine harmonies of the universe.

On a recent visit to Oxford, living for a while in college among friends who are students of the best class, young men who have gained scholarships by hard work, and are not satisfied with merely taking B.A. and M.A. degrees, but are aiming much higher, I was greatly pleased to find that the higher work consisted of searching study of both ancient and modern sociology and moral philosophy. These students were learning to forget the brutality and nastiness of the Greek and Latin poets, and replacing such recollections by logical exercises in the subtleties of Aristotle and the other Greek philosophers, and following in historical order the development of their subjects by the schoolmen and modern philosophers, original independent criticism of all being encouraged by their teachers and examiners. This is healthy scholarship. I understand that Cambridge is moving in the same direction. Sidgwick is doing noble service there, if I may judge by the influence he has already exerted on the high-class Cambridge students I have met.

If we must have ancient literature—old stories of love and fighting—let us have those of our own race, the Scandinavian Sagas. The heroes of these were manly and chivalric; their loves were comparatively decent and natural. I say "if," having personally no respect for the literature of any noble savages, either ancient or modern, and believing firmly that the highest literature mankind has ever known is that which is written in the truly classic language which all mankind will eventually speak.

DIRECT VISION MICROSCOPES.

HAVING but few opportunies of conversation with microscopists, I write with some diffidence on a subject on which I may not have the credit of being (as the saying is) "well posted;" but being in the constant and daily use of a direct-vision microscope, and observing from recent communications and engravings in catalogues and journals that many of the old faults and deficiencies of the instrument remain uncorrected and unsupplied, I venture to forward you an account of certain alterations which I have had made in one now before me, which have rendered it perfectly available for many purposes for which it was previously inapplicable, and have made it in fact, as far as my own requirements go, a very useful, instead of a nearly useless instrument.

The faults of all the instruments of this class with which I am acquainted are the following:—

1. The object examined is rendered indistinct by the amount of side light which falls upon it in its exposed position.

2. The stage arrangements are so imperfect that it is impossible to examine any but the central portion of your slide, or, at best, such a portion as you have previously arranged for examination. There is no possibility of hunting over the middle inch, which is what the field-microscopist frequently wants to do.* In one form, indeed, there is a brass clamp and screw on one side of the rim of the orifice, and a steel spring holder on the other, but though very likely sufficient for class demonstration, I found it quite useless for my sea-side and "green lane" purposes.

And now for the proposed and well-tried remedies. Fault No. 1 is easily dealt with, nothing more being required than one-third of an inch of metal tube blackened internally, the size of, and projecting beyond, the stage aperture; this too would easily carry a polarising prism or a spot lens if desired.

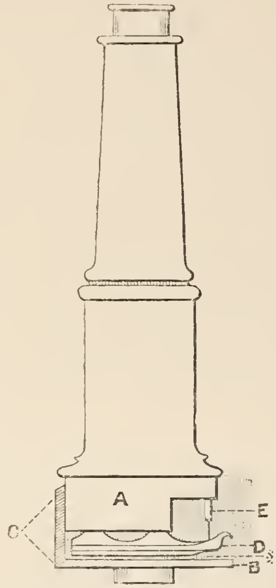

Fig. 131.—Diagram of Direct Illumination Microscope. A. Brass cylinder containing wire spring which is attached to D. B. Stout brass disk or stage fastened to cylinder by C—A strong bar $\frac{3}{4}$ inch wide and $\frac{1}{8}$th inch thick. D. The lighter brass disk, kept in apposition to B by spring, and having two rims, the one for protecting the object from pressure, and the other for steadying purposes. E. Pin and tube, also for steadying purposes. F. Brass tube blackened inside, shutting off side light, etc. *s*, Space between B and D where slide is introduced.

Fault No. 2. The insufficiency of stage, &c., I have remedied thus, the instrument on which I worked being the very nice one introduced by Dr. Beale. I removed the bell-shaped end entirely, and in its place fixed a brass cylinder with a gap in front for the use of reflected light when required, as in the original arrangement. It is three-quarters of an inch long and two inches wide, and to it is attached by a strong bar a stout brass disk or stage with a central

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* Professor Brown's "pocket microscope" would allow of some lateral examination of the middle inch of a tiny slide, but the whole instrument measures only four inches long by one wide, and would therefore be inapplicable for use with slides of the usual dimensions, or for the purposes required by the field naturalist.

aperture of three-quarters of an inch diameter; the interval between it and the cylinder being a quarter of an inch. A thinner brass disk of rather smaller circumference and similar central aperture, but having its edge bordered by a projecting rim both above and below, is kept in close apposition to the first by a coil of wire spring soldered to it, and to the base of the internal circumference of the brass cylinder.

It is between these two disks that the slide is lightly but firmly held, it being easy to move it without jerk or unevenness in any direction. I must now explain the necessity for the projecting rims which, as I have said, border the higher disk. The shallower one, which is deficient in front, should be about the depth of the thickness of an ordinary slide, and is intended to prevent the possible pressure of cemented objects between the disks when searching far from their centre. The deficiency of the rim in front secures the cover glasses from injury. The other rim should be much deeper, its use being to keep the disk central, and working within the cylinder when drawn down. Its border is arched, as will be seen in the diagram, and the points between the arches are bent outwards; the centre one forming a convenient catch for the thumb of the left hand when depressing the disk to introduce the object, and the others steadying the movement in the inside of the cylinder. There is also a small pin attached to this rim which works in a tube fixed to the cylinder, securing perfect steadiness.

When using the microscope for field purposes, I carry it in a leather case with shoulder strap, and in a little pocket case I carry three pairs of thin glass slides 3 × 1 inches, placing any object I wish to examine between two of them.

In conclusion I will only say that these improvements were most satisfactorily carried out by a clever mechanic in this town, and that I can now use the instrument with any object-glass up to an eighth, hunting over the objects in my cabinet with as much ease as when using a mechanical stage, while the illumination is most satisfactory, admitting of all sorts of beautiful modifications which practice will soon suggest.

Diss, Norfolk. T. E. AMYOT.

FROM WINCHESTER TO TORQUAY ON FOOT.

THE following plain and unvarnished account of a short walking-tour may possibly interest some of the readers of SCIENCE-GOSSIP. The object in view was nominally the increase of our conchological collections; but for such a purpose we could not have chosen a worse time of the year. The oppressive heats, which occurred day after day, served to drive the land-shells far into their lurking-places, and, moreover, greatly encouraged in us a spirit of laziness. This being the case, we often tramped along the dusty roads forgetful of our object, and totally averse to a dive among brambles and stinging-nettles in a search which seemed ever destined to prove fruitless. So much for the land-shells. The case of the marine species, of which I was especially anxious to obtain good examples, seemed even worse. The calm sea had neglected to furnish the shore with its usual share of the spoil, and everywhere the same answer greeted our inquiries. "Shells, do you want? The winter's the time for shells, but you'll get none now without a dredge." Whether this remark, which we had from fishermen and collectors alike, was strictly true, every reader of this little sketch must judge for himself. A dredge we had not got, and we did not feel disposed to hire one with a boat and man to look after it.

On the morning of Wednesday, August 6th, 1884, we alighted from the train at Winchester, with the intention of finding our way thence to Torquay. Our desire to keep the sea in sight as much as possible, combined with the difficulty of finding a direct route to Christchurch, made us determine to take the high-road to Southampton. After visiting the old cathedral, we took a short cut across the fields. In the river and streams connected with it, we met with the following species: *Limnæa peregra*, *L. stagnalis*, *L. palustris*, *L. truncatula*, *Physa fontinalis*, *Ancylus fluviatilis*, *Planorbis contortus*, and *Bythinia tentaculata*, and on the banks *Succinea elegans* and *Zonites cellarius*. About halfway to Southampton we found *Helix hortensis*, *H. cantiana*, *H. sericea*, *Cochlicopa lubrica*, *Clausilia rugosa*, and *Cyclostoma elegans*, but for the rest of the day, owing to the extreme heat, we did not attempt to find land-shells. Our search for marine species at Southampton merely resulted in the capture of *Tellina Balthica*, *Mytilus edulis*, *Littorina rudis*, *L. obtusata*, and *L. litorea*.

On Thursday, August 7th, we crossed over to Hythe. The heat was even greater than on the preceding day, and our captures were consequently almost *nil*. Our journey was uneventful until we neared Lymington, where we met with *Anodonta anatina* and *Bythinia tentaculata*, and swarms of *Hydrobia ulvæ* on the muddy banks of the river. Finding we should not have time to walk, we took the train thence to Christchurch.

After an uneventful walk on Friday morning to Bournemouth, we took the boat to Swanage, which place we reached early in the afternoon. The town presents a very compact appearance, all the houses being built entirely of hard stone, roof included. Pushing on, we came to Corfe Castle, a famous old ruin of the eleventh century. On its walls we found *Helix virgata*, *H. rupestris*, *H. aspersa*, *H. lapicida*, *Clausilia rugosa*, and *Pupa umbilicata*. The same evening we reached Lulworth, but as it was dusk when

we left Corfe, we found nothing on our journey worth mentioning.

The first thing I met with on Saturday morning (August 9th) was *Helix aculeata*, and afterwards careful search revealed several other species. The list of our captures is as follows: *Pisidium pusillum*, *Sphærium lacustre*, *Planorbis nautileus*, *Helix rupestris*, *H. virgata*, *H. hortensis* and var. *roseolabiata*, *Clausilia rugosa*, *C. laminata*, *Balea perversa*, *Carychium minimum*, *Bulimus obscurus*, *Zonites cellarius*, and, lastly, *Bulimus acutus*. Finding a boat just starting for Weymouth, we took it, as we were informed it would save us much trouble. On landing at Weymouth, and searching along the sands and rocks, we obtained the following shells: *Venus Gallina*, *Pandora inæquivalvis*, *Pecten opercularis*, *Mactra stultorum*, *M. solida*, var. *truncata*, *Venerupis irus* (with *Saxicava rugosa* in crevices in hard rocks), *Tapes pullastra*, *Trochus magus*, *Tr. cinerarius*, *T. lineatus*, *T. umbilicatus*, *Littorina obtusata*, *L. rudis*, *L. litorea*, *Odostomia lactea*, *Purpura lapillus*, *Nassa reticulata*, *N. incrassata*, *Rissoa cingillus* and var. *rupestris* (under rocks in quantities, alive), *R. parva*, *R. striata*, *R. costata*, *Truncatella truncatula*, and *Cypræa Europæa*. The following day being Sunday, we did not continue our journey, but remained at Weymouth.

On Monday, August 11th, we started *en route* for Bridport. In the hedges near Weymouth we took *Helix hortensis* and var. *roseolabiata*, *H. rufescens* and var. *alba*, *H. rotundata*, *Clausilia rugosa*, *Limax agrestis*, *L. maximus*, and *Arion ater*, one specimen of which was white with an orange margin. We found it impossible to follow the coast-line all the way, so we took the shortest road *viâ* Portesham and Abbotsbury. Near the former spot we noticed *H. caperata* and *H. ericetorum*, and also the butterflies *Lycæna corydon* and *Pyrarga Galatea*. The principal attraction of Abbotsbury appears to be a swannery containing fifteen hundred swans. This we did not see, as it was considerably out of our way. We met with nothing more till we approached Bridport, near which place we noticed *Helix nemoralis* for the first time, and also *H. hortensis*, *H. virgata*, and *Succinea putris*.

Tuesday, August 12th, found us on our way to Lyme Regis. Near Bridport we took *H. hortensis* and *H. nemoralis* in great variety. After an uneventful walk as far as Charmouth, we were glad to find the tide out and our way open along the shore. The cliffs at this place are very imposing and, as everybody knows, swarm with fossils. On the rocks were *Trochus umbilicatus*, *Chiton marginatus*, *Patella vulgata*, *Littorina rudis*, and *Purpura lapillus*, and nearer high-water mark *Trochus lineatus* in moderate abundance. *Littorina neritorides* was extremely common on the pier at Lyme Regis.

On referring to the map, the reader will observe that Lyme is just in Dorset. We were anxious to push our way well into Devon on Wednesday, and consequently did not linger in search of specimens. It was dusk when we reached Budleigh, after passing through Sidmouth and Otterton. Our captures were limited to a few *H. nemoralis*, var. *castanea*, but those of the next day quite consoled us for our bad luck.

It may interest entomologists to know that *Satyrus semele* and *S. Œgeria* were very common on the hills near Budleigh, as we crossed them on our way to Exmouth. We reached the latter place at high-water, and found little else than single valves of *Mactra solida* and *Cardium tuberculatum*. Crossing over to Dawlish Warren, we paced along the margin of the water without expecting to find anything. We were soon agreeably surprised by the frequent occurrence of *Tapes decussatus* and *Scrobicularia piperata*. The fresh appearance of these shells caused us to look about for something better. We were not long in finding it. The discovery of one specimen of *Bulla hydatis* was followed by that of another and another till they appeared strewn on every side. Nor was this all. We soon began to notice black slug-like creatures slowly traversing the mud, and these proved to be the same species in a living state. After taking several we walked on past Dawlish to Teignmouth, and on our way met with *Donax vittatus*, *Cardium tuberculatum*, *C. exiguum*, *Loligo vulgaris*, *Sepia officinalis*, and single valves of *Lutraria elliptica*, *Mactra subtruncata*, and *Psammobia Ferroensis*.

The next day (Friday, August 15th) we went across country from Teignmouth to Torquay. Near the latter place we met with *H. virgata*, *H. aspersa* and var. *grisea*, *H. nemoralis*, and *H. hortensis* (one specimen having the band-formula 00040) all in tolerable abundance. Torquay being our destination, we remained there for a few days, and then returned home by train. Our principal captures there are as follows:—*Cardium aculeatum*, *C. tuberculatum*, *Donax vittatus*, *Venus Gallina*, and *Turritella terebra*; dead shells common in the harbour at Torquay and on the sands at Paignton. *Trochus umbilicatus* and *T. lineatus* associated with the ordinary littoral species on the rocks, and *Helix sericea* in great abundance at Paignton.

Thus ended our little tour, and after our experiences I am convinced that there is no more pleasant way of spending a short holiday than the one we adopted, and no better way of seeing the country than on foot. Autumn is no doubt the most favourable season of the year for a shell-collector's tour, when the high-tides and rough weather bring in many rarities to the shore, and the showers induce the land-shells to emerge from their retreats. In conclusion I may say that it will give me the greatest pleasure to furnish every particular concerning route and expenditure to any one desirous of following our example. SYDNEY C. COCKERELL.

51 *Woodstock Road, Bedford Park, Chiswick, W.*

STUDIES OF COMMON PLANTS.

No. II.—The Common Sunflower (*Helianthus Annuus.*)

By E. A. Swan.

A CAREFUL study of the flower will amply repay the trouble taken. The various parts are beautifully adapted for ensuring fertilization by means of insect agency. Most people are ignorant of the elaborate contrivances by which this is effected. Many look upon this humble denizen of our gardens as worthy of but passing notice, yet nothing can be more unreasonable.

The stalk, as every one knows, supports a flower which consists of, first, several whorls of bracts forming the involucre; second, one or more whorls of yellow florets constituting the ray; and third, a considerable number of blossoms, or perfect florets, called the disc. Each blossom stands on an achene, the covering which contains the seed.

The general principle of the evolution of the flower from the leaf is well exemplified here. The bracts are clearly modified leaves. I have a specimen before me where the connection can be clearly traced. There a leaf on a short stalk starts from the base of the outermost whorl of bracts. Next it is a bract of ordinary dimensions, and, next that, a bract much larger and having a venation almost like a full-sized leaf. Fig. 132 is a rough outline drawing. Both leaves and bracts are covered on the sides and edges with short spines, all pointing towards the extremity. Some of these spines are pointed, others blunt. I find similar spines, though much smaller, on the ray florets, principally on the under-side, and these ray florets have rudimentary achenes on which they stand.

Each blossom consists of the corolla, which is monopetalous, and ends in five lobes; within this the stamens, which are joined half their length from near the top, thus forming a tube; and, within all, the pistil, which is cleft at the top. The base of the corolla swells out so as to form a vessel for the nectar, and it is joined by a neck to the achene, from either side of which, at the top, rises what I may call a short pointed wing. Finally, a rudimentary calyx partly surrounds each blossom from the bottom of the achene to about midway up the corolla. It is more developed on the outside blossoms, but it is present throughout. It has spines pointing towards the extremity; so, too, has each wing; so, too, has the corolla on the outside: and so, too, has the pistil the whole extent of the cleft, but not in the cleft.

Fig. 133 is a sketch of the uppermost side of a ray floret on its rudimentary achene. It will be noticed that where it joins the rudimentary achene there is a neck formed, and the two edges of the floret meet, thus making the primary attempt to mould a cup. My meaning will be clearer by referring to fig. 134, which is the complete achene, wings, neck, cup, and corolla, drawn, like fig. 133, somewhat about the natural size. Thus we have leaves, bracts, ray florets, and blossoms showing a clear connection.

Figs. 135 to 143, both inclusive, will help us in considering the method of fertilization. The outside blossoms are matured first, and, when their work is done, present the appearance shown in fig. 143. The innermost blossoms are matured last. Fig. 135 shows a blossom not yet opened; fig. 136, one where the stamens have just begun to thrust themselves upwards; fig. 137, more upwards; fig. 138, the pistil first appears, and so on. In an ordinary flower, until the

Fig. 132.—Bracts of Sunflower.

Fig. 133.—Ray floret.

Fig. 134.

Fig. 136.

Fig. 135.

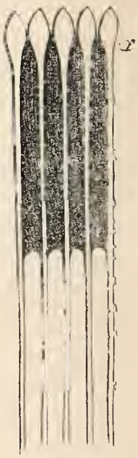


Fig. 144. Stamens of sunflower laid open.

Fig. 137.

Fig. 138.

Fig. 139.

Fig. 140.

Fig. 141.

Fig. 142.

Fig. 143.

seeds have been fertilized throughout, we can observe the stages indicated, from the centre to the outside (that is, from figs. 135 to 143), with never-failing regularity. One more sketch, fig. 144, much enlarged, represents the stamens and anthers, as joined, laid open. Soon after the blossom opens, the stamens, with pistil enclosed, appear above the top. I observed bees frequently visit the flowers and thrust their proboscides down the corolla so as to reach the nectar cups, at the same time rubbing their heads on the anthers and taking off pollen. I also observed that, as soon as the pistil appeared, the stamens began to lower themselves, and I believe this was due partly to shrinkage and partly to the bees continually pressing with their heads in order that they might the better reach the nectar; but I should say that as soon as the pistil has opened as much as to form an angle of 45°, it also would exert its influence and continue to do so until the anthers were brought to the level of the top of the corolla. The pistils are only capable of receiving pollen for fertilizing purposes when open; so that a bee, rubbing its head against anthers where the pistil has neither appeared nor opened, would collect pollen, which it would deposit on the open pistil of another blossom, perhaps on another plant, thus securing cross-fertilization.

There is yet another matter to discuss which is of no little importance. Whence come the stamens and pistil The corolla from a ray floret, the ray floret from a bract, the bract from a leaf, is clear enough. I am inclined to think, though I have not conclusive evidence, that stamens and pistil are developed spines. There are spines on the outside of the corolla, but none on the inside. There are no spines at all on the stamens; there are none on the lower part of the pistil, and the fact of there being spines on the upper part will not much affect the argument. If we look at a ray floret under the microscope, we can clearly see delicate spines on the under-side, spines on the rudimentary achene and the wings, and a few spines on the uppermost side, just above the neck. It is not unusual when one organ or part of a plant is reduced in size for another to be increased. In order to evolve a blossom from a ray floret, the latter must dwindle, besides closing in, and it is not unlikely that the extra nourishment, thus set free, may go towards increasing the internal spines, or some of them, until they develop into stamens and pistil.

THE first number of the "Bulletin of the Des Moines Academy of Science" has been published. The object of the Academy is to issue a series of publications to cover more or less completely the natural history of the State of Iowa, and this first number contains a geographic catalogue of the Unionidæ of the Mississippi Valley, by R. Ellsworth Call.

TEETH OF FLIES.

By W. H. Harris.

No. VII.

CARICEA TIGRINA, Fab.

CARICEA TIGRINA, from which the present illustration is taken, is a rather small but prettily formed fly, and may be taken rather plentifully by sweeping among grass during the whole of the summer months. When once its acquaintance is made no difficulty will be experienced in identifying it on subsequent occasions.

It is about the size of *Musca domestica minor*, ashy grey in colour, with two distinct darkish lines on the thorax. An examination with a lens shows this is caused partly by its being clad with rather strong hairs on these parts and partly by a deposit of pigment in the integument around the basis of the larger hairs.

There are eleven distinct spots of this character on the dorsal and lateral parts of the abdomen, arranged in the following manner. The segment immediately succeeding the thorax bears one spot centrally situated. The next segment has two such spots separated by about the thirty-second part of an inch, the two succeeding segments have each four such marks, thus giving this part of the insect a very pretty appearance. The eyes are very dark, surrounded with a ring of the body colour, the thigh is of the same shade, the tibia rusty brown, while the tarsus is very dark; the proboscis for a considerable portion of its length is hard, dark, and highly polished, incapable of being wholly withdrawn as in many species of the Anthomyiidæ.

The general character of the Caricea, as given by Mr. R. H. Meade in an annotated list of the British Anthomyiidæ, will be found in "The Entomologists' Monthly Magazine," vol. 20, p. 60. For the benefit of those readers who do not possess the work, I append the description thus given: acknowledging my indebtedness to that gentleman for the identification of this creature.

"Eyes bare, widely separated by a space of nearly equal width in both sexes; arista with long hairs; alulets well developed; tibiæ all armed at their apices with four or five spines; anal vein rather short, only reaching about half-way from the base to the margin of the wing."

The lobes terminating the proboscis are small and not readily expanded. To display this portion of the mouth, a method similar to that adopted in the case of *Stomoxys calcitrans* must be employed; and if the incision is made at the right spot an exceedingly symmetrical set of organs will be revealed.

In this case a departure has been made from the course hitherto followed in these notes, the whole set of teeth being given.

The dentition of this creature consists of two distinct types, which are comparable only with organs

possessed by animals widely separated in the scheme of classification; thus we find two groups of pyramidally formed teeth, which strongly presents the character of fish teeth in outward form, and four regions covered with minute plates, which readily recall the gastric teeth in some species of Coleoptera.

Taking the teeth first, we find two groups each consisting of four teeth, having a broad base and terminating in a sharp point; one is largely developed, two of intermediate size and one very small, the base of each appears of a light colour, which indicates a thin structure, while about half the length of each tooth towards the apex is exceedingly dark, and points to a thickening of the organ.

It will be remembered that in former notes of this series attention was drawn to the folding of the membrane forming the tooth as it approached the point of attachment; in the present instance this order is reversed, the basal portion appears delicate, and at about one-third of the entire length of the tooth the fold takes its rise, and is continued to the apex, thus giving this part of the organ a great consistency and power of attrition.

Of the four regions bearing the similarity to gastric teeth two are large, and in the natural position of the mouth occupy the front portion; the other two are smaller, and are situate at the back part of the oral aperture. They each consist of an accumulation of small plates of chitin, arranged like tiles on a roof. If viewed with a low power they look like small spines, but when an enlargment of five or six hundred diameters is adopted, it will be seen they are tolerably broad at the base and terminate in fine points. They are light amber in colour and unitedly cover a large surface of the mouth.

There is also another organ, somewhat sickle-shaped (not shown in the illustration) capable of protrusion and retraction; it is by the action of this part operating against the dental organs that the creature seizes, crushes, and triturates its food.

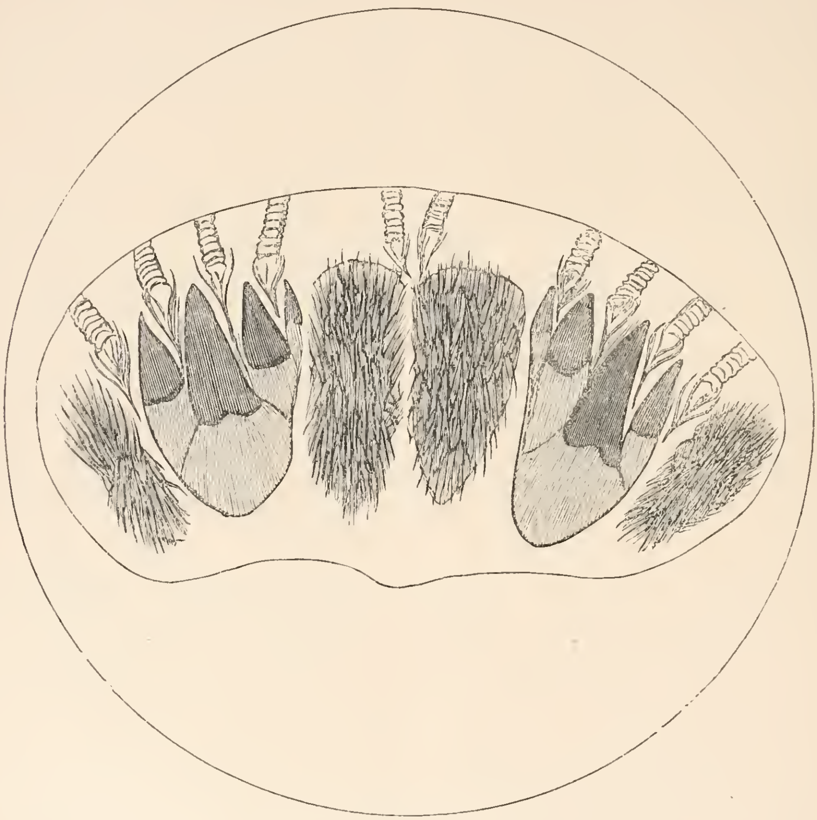


Fig. 145.—Teeth of *Caricea tigrina*. × 200 diam.

It should also be noted that the pseudo-tracheæ are few in number and insignificant in size.

The perpetuation of the species is provided for by the extrusion of perfect larvæ about one-tenth of an inch long, and, judging by their mouth organs, they are powerful agents in the work of destruction of the roots of plants, on which it is presumed they feed.

Cardiff.

SCIENCE IN THE PROVINCES.

VARIOUS Reports and "Proceedings" of Provincial Societies have accumulated, and have been awaiting a due recognition of their merits. It is surely but few schools that can shew such a record as that contained in a book issued from Marlborough College, the result of twenty years' observations in Botany, Entomology, Ornithology, and Meteorology, 1865–84. The bulk of it consists of tables of figures, which could doubtless be made the basis for much induction of an interesting character. The first set shows the earliest observations of plants, in which *Eranthis hiemalis* heads the list with Jan. 23 as an average, and *Hedera helix* comes at the end (Sept. 27). Last notices are not shown, nor how long the plants lasted, and it is evident that more is required to be known than the date of first appearances in comparing a plant which lasts all the season with one which lasts a month or two. Other tables follow for Insects and Birds (93 kinds), and the last entry, after the meteorological tables, gives the heaviest fall of rain, presumably in 24 hours, as 2·32 inches, which is set down to July 14th, 1875, the hour of observation being apparently nowhere given. The labour represented by these tables, both in making the observations and in arranging the results, must have been very considerable.

The Proceedings of the Liverpool Naturalists' Field Club contains, besides the presidential address, an account of the field meetings, with resumés of their botanical results and lists of the plants found; accounts of the botanical exercises and prizes, and a list of books useful in the study of Natural History, with prices and publishers. The club is a large one, with over 400 members, and its work seems to be largely botanical. It is to be hoped that its authorities will keep in view the question of the preservation of rare plants, which forms the subject of a note in another column; and, indeed, some remarks by Mr. John Vicars show that the subject is not wholly overlooked.

The work of the Hackney Microscopical and Natural History Society, of which the eighth annual Report is published, is more general, to judge by the notices of papers read or lectures delivered. Among the subjects of these are Insects and Flowers, The Food of Man, Natural History Notes in a Town Garden, The Formation of Chalk, Microscope work, and local Geology. A list of Field Excursions for the present year is given, and a Catalogue of the Books in the Library. The meetings of the Society are held at the Morley Hall, Hackney, the President being Dr. M. C. Cooke, M.A.

The Fifteenth Annual Report of the Wellington College Natural Science Society contains notices of numerous lectures delivered at the open meetings of the society, and lists of plants, insects, and birds, which seem to want further explanation to make them comprehensible. Monthly meteorological tables follow, and brief entomological and zoological reports conclude the volume.

The twenty-seventh Report of the East Kent Natural History Society shows a membership of over seventy, and gives titles of papers, addresses and notes presented, and the names of objects exhibited. A very important feature of the Society is its extensive and valuable library.

The Louth Naturalists' Society has held its first annual meeting, and has issued a report, balance sheet, &c. The number of ordinary members is at present small, but if they are all working members that may not be of much consequence. Mr. H. Wallis Kew is the hon. secretary and treasurer.

The Journal of Proceedings of the Essex Field Club, now published separately from the Transactions, though only recently issued, is concerned almost entirely with the year 1883. It contains reports of ordinary and Field meetings, and also of papers read, among these being an interesting note, by Mr. W. White, on an abnormality in the flowers of fuchsia, with illustrations. The Transactions of the same club contains the Presidential address by Professor Boulger in January 1884, and other papers mostly read in 1883, including Notes on Deneholes, by Mr. T. Vincent Holmes, F.G.S., illustrated. The club is fortunate in having Epping Forest as a hunting ground, and the Proceedings contain evidence of work done by them in opposing the extension of the railway to High Beach.

The lately formed East of Scotland Union of Naturalists' Societies has issued a volume of Reports. It contains the address of the president, Dr. F. Buchanan White, at the first annual meeting, in which he gives some very useful hints as to the work of such a local union. This is followed by a number of preliminary reports, which have been drawn up on the state of knowledge of the various departments of Natural Science in the district. It was suggested that the reporters should say, as far as possible, whether the subject in question had been investigated; what parts of it more especially required further investigation, both as regards the district and the subject; what was the probable richness of the district as to number of species; and whether any important works had been published on the subject, as regarded the district; and also to offer suggestions for immediate work. Reports based on such lines as these should be very useful to those members who have a fund of scientific energy, and only want to know in what direction best to turn it.

The Transactions of the Chichester and West Sussex Natural History and Microscopical Society is also to hand. This society numbers 110 members and associates, and its Transactions contain, besides the ordinary business material, several papers on various Natural History subjects, including a very interesting one on the *Hymenoptera* (*aculeata*) of West Sussex, by Mr. Edward Saunders, F.L.S.

NOTES ON THE MOVEMENT OF THE POLLINIA OF *ORCHIS MASCULA*.

MR. E. MALAN, in his interesting paper in the May number of SCIENCE-GOSSIP, on the Fertilisation of *Orchis mascula*, replying to some remarks made by a previous correspondent, infers, if I read aright, that the form of the pollinium probably has something to do with its movement, and suggests an experiment with "a roll of moist clay."

There appears to me to be an insuperable difficulty in accepting this theory as an explanation of the movement of the pollinia. The change of position is uniformly in one direction, and this notwithstanding that a pollinium may be held in such a position as to cause the direction of movement to be against gravity.

An additional proof that the overhanging weight of the pollinium has nothing to do with its movement may be tested by a simple experiment. Remove with a pair of forceps one of the organs in question, without touching the viscid disc, or allowing it to come into contact with anything; carefully observe it under the microscope, while still held quite free; the disc will be seen to move through a similar arc, and in the same direction as it would have caused the caudicle to sweep had the disc been attached to anything, thus showing weight and form are not factors in the sense inferred by Mr. Malan.

That the drying of the viscid disc is the cause of the movement there can, I presume, be little doubt; the following experiments were made with the view of satisfying myself on this point. Selecting properly matured flowers, I removed a pollinium with a pair of forceps as before described. I immersed the basal portion in glycerine, and fixed it steadily under the microscope; after many hours' observation no visible movement of parts had taken placc. Proceeding in the same way with water, I found the function, though arrested for a time, was afterwards performed when the water had evaporated; substituting benzine there was little, if any, delay in the movement as compared with a pollinium in its natural condition.

Immersing a pollinium in glycerine diluted with water on a slip of glass, a very curious phenomenon was observed. Tiny viscid globules and vermicular threads of same were ejected from the cells of the disc with some energy, resembling a miniature bombardment of particles, the general appearance being similar to the action of evaporating spirit when viewed under the microscope. A globule or thread after being emitted would frequently remain stationary for a second or two; it would then dart off with a rapid motion, as though propelled by an explosive force operating in the region of the disc.

The action was the same when water only was used.

In both cases I did not observe any subsequent movement in the parts of the pollinium. Substituting benzine, the emission was exceedingly feeble in some cases, in others I altogether failed to detect it, while on evaporation taking place the natural movement again set in.

With pure glycerine there was no emission, the disc became quite transparent in a very short time, but on adding a little water the action instantly commenced, the globules being ejected as before described.

The movement of the pollinia may to some extent, if not entirely, be due to the chemical qualities of the contents of the cells of the disc; the cause of movement is undoubtedly due to the rapid contraction of the cellular tissue caused by drying. The speedy evaporation may be induced by the contents of the cells being of a volatile character, as indicated by the experiment; but on this point I should prefer the judgment of others more competent to speak than myself.

Mr. Malan will not, I hope, think these remarks are made in a controversial spirit, but simply with the view of contributing a mite towards solving a question in the economy of a flower which is at once as interesting as it is beautiful.

W. H. HARRIS.

Cardiff.

SCIENCE-GOSSIP.

WEST SUSSEX NATURAL HISTORY SOCIETY.—A very agreeable soirée was held by this Society on June 9th at Chichester, in the lecture room of the Museum. A prominent feature in the exhibition of natural objects was that of about 200 species of living wild flowers. Some excellent diagrams were displayed, and many interesting microscopical objects shown.

IT appears from Dr. Perkin's presidential address to the Society of Chemical Industry, as reported in "Nature," that derivatives of quinoline as substitutes for quinine have been prepared from coal-tar. Though the artificial formation of quinine itself has not yet been discovered, nevertheless other bodies have been formed which are thought to have medical value, and it is pointed out as an interesting fact that the coal-tar colour industry itself had its origin in the attempt to form quinine artificially.

"SCIENCE" says that during the last twenty years Swiss glaciers have shrunk in size, melting away up-hill and retreating as much as a thousand feet or more from their fresh-looking moraines. Of late, however, it adds, not only has the retreat in many cases ceased, but an advance has taken place during the last two or three years. A map showing the recession of the glacier of the Rhone during some years past may be found in the same number of "Science."

SCIENCE has lately lost one of her oldest workers in the person of M. Henri Milne-Edwards, who died on July 29th, at the age of 85. He was known for his Zoological researches on Crustaceans, and in the anatomy and physiology of marine animals of the French coast, for his Cours élémentaire de Zoologie, and his great work on the comparative anatomy of man and animals, which was finished only a few years ago. He succeeded Isidore Geoffroy St. Hilaire as professor of Zoology in the Jardin des Plantes, besides holding at various times other offices. He was the father of M. Alphonse Milne-Edwards.

IT is understood that the Government will apply to Parliament for State aid for the Marine Biological Association on condition that the work is carried on in concert and harmony with the Scotch Fishery Board.

IT appears, on the authority of Mr. A. W. Bennett, in a letter to "Nature," that there are in the American flora plants regarded as belonging to the same species as European plants, but with a difference difficult to define but yet recognisable. He instances *Osmunda regalis* and *Pteris aquilina*, which are abundant in Canada, but have a general habit which marks them off from the English forms. The American *Plantago major* is stated, he says, to be distinguishable by the American horses from our wayside weed, though there is scarcely any difference. Some English weeds are turning out the native ones, but the daisy and primrose, it appears, will not naturalise themselves in America.

THE "Colonies and India" in an article on wool growing, after speaking of the successful introduction of the Angora goat into South Africa, suggests the acclimatisation in new countries of the alpaca, vicuña, and llama, at present restricted to South America. The hair of these and other animals is, it says, increasing in demand, and it considers the mountainous districts of South Africa probably better adapted for the alpaca than the plains of Australia, where an attempt to introduce this animal did not meet with the success expected.

FROM a paper published in the same journal it appears that Messrs. H. B. Dixon and H. F. Lowe have shown that by the ignition to a white heat of a platinum wire in a well-dried mixture of carbonic oxide and oxygen gases in the required proportions, the gases may be made to combine. No flame was visible round the wire and apparently no explosion took place.

IN the same journal Mr. Thomas Turner describes some experiments with relation to the influence of silicon on the properties of cast iron. They lead, he says, to the conclusion that, at all events under the circumstances given, a suitable addition of silicon to cast iron may considerably increase its tenacity, a result in accordance with previous opinion as quoted by Mr. Turner.

THE result of experiments on the leaves of *Euonymus japonica*, by P. P. Deherain and L. Maquenne, is said to indicate that the respiration of leaves is not accompanied by a simple change of oxygen into carbonic acid gas, but that an internal combustion takes place in them similar to fermentation, the effect being the evolution of more carbonic acid gas than equals the oxygen supplied. An abstract of the author's paper may be found in the Journal of the Chemical Society for August.

A NEW volume of the "Nature" Series (Macmillan) is expected, the author being Sir John Lubbock, and the subject "Flowers, Insects, and Leaves."

IT is said that Professor Huxley has been asked to retain his post as Dean of the School of Science, South Kensington, and to direct generally the course of biological teaching there.

THE ability of salmon to jump up waterfalls is the subject of some interesting details given by Professor A. Landmark, chief director of the Norwegian Fisheries, of which a notice may be found in "Nature." He states that under some circumstances salmon have been found to jump sixteen feet perpendicularly, and that he knows this by having seen them jump across two masts three and a half feet apart which have been placed across the river about sixteen feet above the water, at the Hellefos, in the Drams River, at Haugsend. He even says that some salmon when jumping a perpendicular fall are able, if they strike the fall straight with the snout, to remain for a minute or two in the falling mass of water should they happen not to clear the fall at one jump; after which with a switch of the tail the rest of the fall can be cleared.

IN a report by Mr. S. Stack, Director of Agriculture in Assam, an extract from which may be found in the "Entomologist" for August the author in considering Assam as a source of supply for the English silk market says the wild silkworms of Assam are out of the question, being much too scarce. Of domesticated worms there are the mulberry worm (*Bombyx textor*), the *muga* worm (*Antheræa Assama*) and the castor-oil worm (*Attacus ricini*). From the two latter Mr. Stack thinks something might be done, in the export not of the thread but of the waste cocoons, those from which the moth has been allowed to eat its way. It appears that from waste cocoons imported from India or China the manufacture of silk plushes and similar fabrics forms a flourishing branch of the English silk industry.

IT appears that the authorities at South Kensington do not intend to appoint a successor to Professor Huxley, as Professor of Biology at the School of Science, but have considerably increased the salary of Mr. Howes, Professor Huxley's assistant.

IT seems only too probable that ballooning has cost another life. Mr. F. A. Gower, who was associated with Mr. Bell in telephone improvement, left Cherbourg on July 18th, to cross the Channel in his balloon, and has not been heard of since.

MR. A. GRAHAM BELL describes in "Nature" some experiments which were made in his presence of the method proposed by Mr. F. Della Torre, of Baltimore, for preventing the collision of ships with icebergs during a fog or with other ships. A musket with a speaking trumpet attached to the muzzle was fired with blank cartridges at passing vessels, and after a longer or shorter interval an echo was heard. This was the case when the ships were as much as appeared to be a mile off. An echo was even obtained from a small tug-boat approaching the launch on which the experiments were made. It seems that a return of sound is caused also by the ripples on the surface of the water, the effect being in this case like the rolling of thunder and lasting for some seconds.

THE hundredth birthday of M. Chevreul, the chemist, perhaps the oldest man of science living, takes place on August 31st, he having been born in 1785, and preparations have been made by Paris students for its celebration.

IT is stated in "Science" that Professor Tyndall generously gave the net result of his American lecturing tour in 1872–3 as a fund for the education of young physicists at European Universities, but that as difficulties arose in this disposal of the fund, the gift, which has in the meantime accumulated to thirty-two thousand dollars, has lately been divided by Professor Tyndall equally between Harvard, Columbia College and Pennsylvania University for the maintenance of graduate scholarships or fellowships in physics.

A BIOGRAPHY of Mr. Darwin by his son, Mr. G. H. Darwin, is expected to be published before the end of the year.

FROM a report in the "English Mechanic" of a lecture delivered by Dr. P. Ebell at Hanover, it appears that the effect of "grass bleaching" has been shown by previous investigation to be due not to ozone, as was supposed, but to oxygenated water or hydrogen peroxide, which forms an oxidising agent having the advantage over those practically employed of not injuring the material. It is said that the difficulties of preparing oxygenated water on the large scale have been overcome, a three per cent. solution (by weight) being obtainable at a moderate price and in any quantity, and that it may be considered as the bleaching agent which is to rule in the future.

A NEW soldering material for sealing up food-tins is said to have been patented, consisting of a solution of lactic acid and glycerol in water, for which is claimed a freedom from the ill-effects which have been attributed to chloride of zinc.

MICROSCOPY.

COLE'S STUDIES IN MICROSCOPICAL SCIENCE.—The last set of these studies received consists of slides showing a transverse section of a feather in its follicle; vertical section of female receptacle of marchantia, showing archegonia; lung tuberculosis; and a transverse section of tail of puppy; together with the accompanying chromo-lithographs and text.

THE JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY.—The August number contains a paper by Messrs. F. R. Cheshire and Watson Cheyn on *Bacillus alvei;* the Cause of Foul Brood in Bees, illustrated by two plates (see this vol. p. 114); a paper by Dr. R. L. Maddox, on Feeding Insects with Bacilli; an Account of Four New Species of Flosculari, and Five other New Species of Rotifera, by Dr. C. T. Hudson, illustrated; and the summary of current researches.

THE JOURNAL OF MICROSCOPY.—The July number of the Journal of Microscopy and Natural Science, the Quarterly Journal of the Postal Microscopical Society, contains papers on Cystopus, or White Rust, by Mr. George Norman, F.R.M.S., illustrated; on Mounting Beetles, &c., without pressure, by Robert Gillo; on What is a Plant? Part ii., by H. W. S. Worsley-Benison, F.L.S.; on *Chironomus Prasinus*, Part ii., by A. Hammond, F.L.S.; on Animal Metamorphosis, Part ii., by J. B. Jeaffreson, M.R.C.S., illustrated; the Microscope, and How to Use It, Part iii., by V. A. Latham; and on Diatoms in the Stomachs of Shell-Fish and Crustacea, by E. B. Courroux. There are three plates of figures at the end.

THE ANATOMY OF THE COCKROACH.—In reply to J. H. Moorhead, I venture to give the following hints, until some friend comes forward who is better able than I am to do so. There have been some excellent slides circulated in the Postal M. Boxes mounted by one of our members, Mr. A. W. Lyons, illustrating these very articles a few weeks ago. The wing of a male cockroach may be bleached in the following solution. Hydrochloric acid, gtt. (drops) x.; chlorate of potash ʒss; aqua ℥j. This will render antennæ and wings transparent. Wash well, dry and mount in C. balsam and benzole. Many are rendered transparent enough by merely soaking in turpentine. Instead of the above, a weak solution of chloride of lime may be used, by which means the nerves in antennæ will be well seen. I have some mounted in glycerine jelly, first soaking them in equal parts of glycerine spirit and water. Elytron: after soaking in turpentine, cleaning and drying, soak in benzole and mount in benzole and balsam. Gizzard is separated from other parts, cut open, soaked in potass, wash well, mount as above or in gly. The gizzard may be obtained by holding insects firmly with pair of tweezers, and with back of dissecting

knife draw the head from the body, the head brings with it the stomach, gizzard and chief portion of digestive organs. Eyes, after being cut from the head, are soaked for a short time in liquor potass; they may be mounted dry, the facets show well; or soak in equal parts of gly. spirit and water, and mount in gly. jelly. Tongue mount as above. Spiracles soak and mount as above, but to see them properly, the skin must be stretched to show the part between the segments. The salivary glands sent to P. M. Soc. boxes by Mr. A. W. Lyons were stained carmine and mounted in C. b. and benzole.—*V. A. Latham.*

ZOOLOGY.

THE AIR-BLADDER OF FISHES.—A very interesting paper on this subject by Mr. Charles Morris is printed in the "Proceedings of the Academy of Natural Sciences of Philadelphia." He describes the air-bladder as at present most generally a closed sac, containing, in fresh-water fishes, nearly pure nitrogen; in ocean fishes, particularly in deep swimmers, a sometimes considerable excess of oxygen. He considers that the air-bladder is not now an organ of functional importance, though it may serve certain uses, such as to raise or lower the fish in the water, to keep its back uppermost, to raise or depress the fore part of the body, &c. He looks upon it as a survival of a breathing organ, and as being now on the road to extinction. This view he supports by reference to embryological evidence and to the condition of existing ganoids and elasmobranchs, as affording indications of the possible state of matters during the Silurian and Devonian period when these two orders were abundant. Existing elasmobranchs are destitute of air bladders, both in the larval and mature stages; while existing ganoids possess one which retains a fully-developed pneumatic duct in the mature stage. The sub-order of the Dipnoi possesses a bladder functionally active as a lung. Of these latter the Australian lung-fish (Ceratodus) has a single air-bladder with symmetrically arranged breathing pouches, and is supposed to breathe with its lungs when the water is muddy or otherwise unfit for use. Finally Lepidosiren and Protopterus have completely formed lungs of cellular structure with two lateral chambers and a pulmonary artery. Mr. Morris thinks that not only may the ancient fishes have used their air-bladders for the occasional direct breathing of air when the water was thick or muddy or lacking in sufficient aeration, or when the pools dried up, though it was such causes as these that probably led to the original development of the air-breathing organ, but that in the absence of foes in the shape of vertebrate land animals they may have gained the habit of leaving the water temporarily in search of food. Since even now, when so many active enemies are to be found in the land, many fish do invade the shore, and some even climb trees, he is of opinion that it is quite possible that in the early period when it could be done without danger, very many fishes may have paid temporary visits to the land.

LIMNÆA STAGNALIS A PAPER-FEEDER.—This afternoon I visited the pond on Chislehurst Common, where the variety of *L. stagnalis* which I provisionally call *elegantula* abounds. The hot weather had much diminished the size of the little pond, and the water-weed (*Potamogeton crispus*) is quite insufficient apparently to supply the wants of the very numerous Limnææ as well as an abundance of *Planorbis spirorbis*. At one particular spot, however, there seemed to be something very enticing, for here the *L. stagnalis* were gathered together, so that for the space of about a square foot nothing else could be seen. Being curious to ascertain the reason of this vast assembly, I divided the crowd. The attraction was nothing more than an old newspaper, which had probably been blown into the pond, and which was torn to shreds and partly devoured by the ravenous snails. It did not contain anything wrapped in it, the paper was the sole attraction. Helices in confinement, as most collectors are aware, will readily eat paper if they can get nothing better, but I never heard of Limnæa doing so before. I brought some of these snails home and put them into some water with paper, pelargonium and rose petals, leaves of ivy and bracken, and flowers of *Vicia cracca*. They "went for" the pelargonium petals, and these are already riddled with holes.—*T. D. A. Cockerell.*

THE NEST OF THE FIFTEEN-SPINED STICKLEBACK.—Professor Karl Möbius says that the sea-stickleback (*Spinachia vulgaris*, Flem.) constructs a nest for its eggs and young, employing delicate shallow water plants, making with these a soft rounded mass 5-8 centim. in diameter upon Zosteræ, seaweed fronds, or piles of landing-stages, which nest the male surrounds with white silky threads, and then keeps watch over. Professor Möbius has been able to throw light upon the previously unknown origin of these white threads. He says they are nitrogenous, made of a peculiar modification of mucine, and are formed in the kidney of the male, which produce it during the breeding-season only; and the male fish has only to swim round the nest while the thread-forming mucus is given off, and this attaches itself to solid objects that it touches. Further details may be found in a translation given in the August number of the "Annals and Magazine of Natural History."

MOLLUSCA IN MANITOBA.—In the "Journal of Conchology" for July may be found a paper by Mr. Robert Miller Christy, entitled "Notes on the Land and Freshwater Mollusca of Manitoba." The writer

observes that it is remarkable that so many species as exist there should be able to do so in a country where the temperature has been known to fall as low as 50·5° F. The absence of shells from the bare open surface of the prairies he attributes to the extensive fires that take place upon them, and refers to his previously-expressed opinion that the absence of earthworms is due to the same cause.

BIRDS OF THE SOLWAY DISTRICT.—"The Naturalist" for August contains the first part of some notes on the birds of the Solway district by Mr. J. J. Armistead, the notes given being mostly due to his own observation, together with observations made at the Ross Lighthouse.

DRYINUS FORMICARIUS.—In the "Entomologist" for August Dr. E. Capron records the capture of *Dryinus formicarius*, Latr., at Shiere, and in his note says that it is very rare both in England and other countries; the male is unknown, and nothing is known of the habits of the insect, which, although his specimen is quite three lines in length, he thinks is no doubt parasitic, probably finding its host in the order Homoptera.

THE PERIODICAL CICADA.—This is the title of a Bulletin issued by the United States Department of Agriculture, the author being Dr. C. V. Riley. The *Cicada septendecim* is an American insect which comes out in broods every seventeen years, while there is also a race, with no perceptible specific difference, of which the broods come out at thirteen-year intervals, and which Dr. Riley has therefore named *C. tredecim*. Moreover, in both races there are two distinct forms, a larger and a smaller, the former by far the more numerous. The broods come out in different years in different parts of the States, and a list of many broods is given with particulars of their appearances, &c. Every year it is said, for the next seventeen years, except 1887, 1890, and 1892, will be somewhere a cicada year. Speaking generally, the seventeen-year broods belong to the Northern and the thirteen-year to the Southern States.

BOTANY.

THE PRESERVATION OF OUR RARE NATIVE PLANTS.—The Council of the Midland Union of Natural History Societies has taken a most commendable step in issuing a notice drawing attention to the threatened extinction of rare plants, a question which has arisen lately in connection also with the Swiss flora. It is a subject which ought to receive the serious attention of all field-botanists; and indeed, those who collect personally or by agents, in order to sell, are perhaps not all of them beyond the reach of an appeal. At their door much of the mischief is to be laid, but they are not the only causes, in the opinion of the council, who name, besides, the operations of exchange clubs, the careless and indiscriminate gathering of plants by botanists and students, often with their roots or seeds, and the reckless gathering of large numbers of specimens by individual botanists. Various recommendations given with a view to lessening the evil are—to abstain from countenancing the purchase of native plants from professional plant-hunters, either for their rarity or for their decorative value; that botanists should make but limited use of exchange clubs, and exclude rare plants from their operations; that they should restrict themselves in the gathering of plants, and even abstain altogether in some cases; and that tourists and amateurs be urged to refrain from collecting rare plants, especially when in flower or in seed, as few of those gathered under such conditions can live after removal. What seems to be wanted is that this matter should become a point of honour among botanists, and if it were widely understood that a true botanist did not pride himself on the number of rare plants he had possessed himself of, a feeling would probably follow that it was no special credit to have such in one's collection, and certainly not to make them an object of eager acquisition. One other recommendation may be added to those advanced by the council, viz., to abstain as a rule from telling the localities where rare plants may be found. The compilers of floras will hardly like this, but as they have the power of doing harm in this direction, it is as well to point it out. Moreover, there is no credit in marching off to gather rare plants whose localities have been learnt from a book. Extinction of species is a thing that has doubtless gone on since the world began; but botanists need not hasten it, and by consideration and the practice of self-denial may do something to hinder it.

WHAT IS A PLANT?—Under this title Mr. H. W. S. Worsley-Benison, F.L.S., in a paper reprinted from the "Journal of Microscopy and Natural Science," enumerates various points which appear to afford distinctions between plants and animals, viz., Form, presence of cellulose, of starch, of chlorophyll, function of locomotion, of digestion, of circulation, presence of nitrogen, function of respiration, of sensation, and lastly, the nature of the food. Under these different headings he gives explanatory remarks and examples, and towards the end of the paper says that the case will be found to be pretty much this, that while many of the points are not distinctive enough, "*in the presence of a cellulose coat in the plant-cell, in digestion followed by absorption, and in the power to manufacture protein*, we find fairly constant and well-marked distinctions; the *morphological* feature of plants being this *cellulous coat*; of animals, its absence; the *physiological* peculiarity of plants, this *manufacturing power*; of animals, the want of it." The paper forms a very useful summary of the points bearing on this question.

GEOLOGY, &c.

RATE OF SURFACE DENUDATION.—The following results are extracted from among numerous others given in a paper by Mr. Mellard Reade, F.G.S., entitled "Denudation of the Two Americas," a presidential address to the Liverpool Geological Society. The proportion of total solids in solution in the Mississippi, a few miles above New Orleans, has been estimated by analysis to be $\frac{1}{3013}$ by weight of the water. This amount is reckoned to give in round numbers about 150,000,000 tons or 80 square miles of rock 1 foot thick discharged per annum by the Mississippi into the Gulf of Mexico; and the proportion of sedimentary matter has been estimated at over 362,000,000 tons. The rate of removal of the surface of the basin of the Mississippi, taking into account both the dissolved and the suspended matters, is taken to be about a foot in 4,500 years. Attention is drawn to the fact that over 20,000,000 tons of silica are annually poured into the sea by this river, as a remarkable fact, when the usual apparent insolubility of silica is remembered. A sample of water from the Amazon showed of dissolved solids only $\frac{1}{16890}$ of its weight, or roughly 160,000,000 tons discharged per annum, or 50 tons per square mile per annum. Mr. Reade thinks that a former estimate of his as to the general rate of solution by rain for the whole world is not far wrong, viz. about 100 tons of rocky matter per English square mile per annum, $\frac{1}{12978}$ of a foot per annum being removed in a soluble form every year from the surface of England and Wales. There seems to be in river water about three times as much matter carried down in suspension as in solution.

MR. A. J. JUKES-BROWNE ON STRATIGRAPHICAL ARRANGEMENT.—Mr. A. J. Jukes-Browne, in a paper on rock-classification in the "Geological Magazine" for July, gives a Table showing some new proposals for nomenclature. He divides the Tertiary into two systems, the Hantonian (from Hampshire), which contains the Eocene and Oligocene; and the Icenian (from the Iceni), a name formerly proposed, with a narrower meaning, by Dr. S. P. Woodward, and which includes the Miocene, Pliocene, and Pleistocene. His systems thus become the Icenian, Hantonian, Cretaceous, Jurassic, Triassic, ——, Carboniferous, Devonian, Silurian, Ordovician, Cambrian, Archæan or Pre-Cambrian. The primary divisions of the Ordovician are the Arenig Grits, Llandeilo Flags, and Bala Rocks; those of the Silurian being the Valentian (lowest), Salopian, and Clunian (forest of Clun). The Permian becomes merely a primary division under the name of Dyas. The Wealden and Neocomian are placed together as a group or stage of the Lower primary division of the Cretaceous system, followed immediately above by the Vectian or Lower Greensand, the name Vectian being derived from the Isle of Wight. This paper will repay perusal by those interested in Stratigraphical Geology.

Since the above was written a paper has appeared in the same journal for last month by Dr. Henry Hicks, F.R.S., in which he proposes to use the term Cambrian as one of the main divisions of the Palæozoic Rocks, the others being the Devonian and Carboniferous. The Cambrian he would subdivide in descending order into Silurian, Ordovician, and Georgian primary divisions, the latter name being taken "from the districts bordering St. George's Channel, where the lower rocks (Llanberis, Harlech, Menevian, &c.) are best exposed, and where they have been mainly examined." He says it may be found advisable to group the upper system also of the Palæozoic Rocks into one system, in which case the Devonian would be placed as the lowest of three Primary Divisions. He prefers for subordinate divisions, as far as possible, geographical terms with wide applications.

FOSSIL ALGÆ AT KIRKCALDY.—In a large excavation made at the Kirkaldy Gas Works, a stratum previously unknown as existing here was cut through, and found to contain many fossils, apparently of wood. On making transparent sections of them for microscopic examination, however, I found that they are fossil algæ, having a very near agreement with sections of recent stalks of *Laminaria digitata* and *L. saccharina*. Like the Laminaria, the sections show three regions, in the centre, a large circular division of irregular cellular tissue; surrounding it, a broad zone of parenchyma with large cells, which are somewhat longer vertically than their horizontal diameter, as is seen by longitudinal sections; round this another broad zone of parenchyma, in which the cells are smaller and arranged in radiating rows; then the epiderm. The three zones occupy about equal breadths. The largest stems I have seen are about four inches in diameter. Mr. Macpherson, manager of the gas works, has two of this size, and about four or five feet long. There is abundance of pieces of smaller size, many of them flattened, and there will be no difficulty in procuring these fossils for months to come, as the excavated stuff is laid on the beach, and the washing of the sea seems to separate the fossils and make them more easily seen. It is worthy of notice that the outside of the fossils has a very great resemblance to that of recent Laminaria which have been washed ashore and dried. The sections of the fossils—both cross and longitudinal—stand grinding well, and are very beautiful. The stratum is situated in the Carboniferous formation, and there are two seams of coal, about eighty feet apart, not very far below it, which have been anciently wrought. I propose to name the fossil in my collection of slides *Halophytis magnum* till I hear something about it —*John Sang.*

Boring in the S.E. of England.—It appears from notes by Professor Judd and Mr. C. Homersham, read to the Geological Society, that boring at Richmond, Surrey, after having been carried on to a total depth of 1447 feet, has had to be given up. This is 145 feet deeper than any other well in the London Basin, and the strata in which the boring terminated consisted of red and variegated sandstones and marls with a dip of about 30°, which might be Poikilitic, or Carboniferous, or Old Red Sandstone. Furthermore, a boring at Chatham yields confirmatory evidence as to the distribution of the Jurassic rocks south of the London basin, and it is considered that we have now direct evidence of the existence and position of Lower, Middle, and Upper Oolite Strata respectively below the Cretaceous Rocks of S.E. England.

NOTES AND QUERIES.

A Forest of Palms.—At Bordighera, on the Gulf of Genoa, can be seen a veritable forest of palms, thousands upon thousands flourishing in tropical luxuriance, from the infant plant to the fully grown with its leafy crown and larger clusters of fruit, which, however, rarely comes to maturity, the sun not having sufficient power to force the plants to secrete the necessary saccharine matter. One may also see around numerous aloes with their tree-like blossoms, and along the water-courses in the lower grounds small groves of bamboos cultivated to form supports on which to train the vines on the mountain sides. Each year a large quantity of leaves are cut and despatched to Rome for the decoration of St. Peter's Cathedral on Palm Sunday; this contract appears to have originated from an ancestor of the present owners rendering the Pope some great service, and for reward he and his heirs were ordered to supply the whole of the palms for that occasion for ever.—*J. R. M.*

Notes on Insects.—Last September I "treacled" on various walls and trees in my garden, and in the daytime I several times saw *V. atalanta* enjoying the sweets meant for nocturnal visitors. I believe it is not usual to find butterflies at treacle, although I have frequently seen numbers of atalanta on plums. One night, on examining a treacle on the trunk of a young black poplar-tree, I saw a splendid specimen of *C. nupta* sitting on the trunk. Before I could capture her, she flew away. I returned in an hour, and found her on the same tree, and captured her, him, or it. This would seem to show that Catocalas, as well as Nymphalidæ, revisit a place after being disturbed and frightened away. Contrary to the usual fate of "treaclers," I several times in September took good catches on moonlight nights, while on one dark night I found very few moths. The weather during the week had been rather rainy. I have several times noticed that *P. Alexis* is rather fond of swampy fields. Have any of your readers noticed this, or was it a mere accident?—*F. H. Perry Coste.*

Notes on Blackbirds and Sparrows.—I have just witnessed two incidents which illustrate the scarcity of food for birds at this season of the year, and the readiness with which the feathered tribe adjust their habits to their environment. Last evening I saw a hen blackbird with one young one hopping over the lawn in search of food. In close attendance were two sparrows, and the reason of this attention was soon apparent. No sooner had the hen found a toothsome morsel for her chick than one or other of the uninvited guests helped themselves to it before it could be passed from the bill of the old blackbird to that of the young one. The broad bill of the sparrow is ill fitted to drag the worms from the now hardened ground; its ingenuity had found a substitute. Somewhat later another blackbird, who evidently had some hungry young ones in a nest at hand, appeared to have some difficulty in finding sufficient food for them. The ground was very hard, worms were scarce, and the lawn had been carefully hunted over by the previous pair. A lazy beetle is droning overhead, and quick as thought he is caught on the wing, killed, and taken to the nest. Again and again was the feat repeated, and not even the fly-catcher, who was busy at his usual avocations at a little distance, could have shown greater dexterity.—*John I. Plummer, July 1st,* 1885.

"Druid Stones" at Stanton Drew.—Can you give me information respecting the "Druid Stones" at Stanton Drew, about five miles from Bristol. 1. Are they Druidical remains? 2. What was their geological origin or locality? 3. How were they probably transported, *i.e.* are they erratic blocks, or of local origin?—*Geo. Bird.*

The Pied Fly-Catcher.—With regard to the query from A. C. Pass, I beg to state that the above bird has been seen several times this season in the Keswick district. It is not a rare bird here.—*J. W. Goodall, The Museum, Keswick.*

Glaucium phœniceum.—Perhaps it may interest your readers to know that I found, on a waste piece of ground in the vicinity of this town, July 14th, a specimen of *Glaucium phœniceum* (Crantz); without doubt it is an introduction.—*John J. Kidd, Lynn, Norfolk.*

Corolla of Lonicera periclymenum.—During my botanical wanderings last week I was surprised to find numerous specimens of *Lonicera*, the corollas of which had assumed a green hue, instead of yellow. What is the cause of this peculiarity?—*B. L.*

Colias.—Though south of Louth, it may interest H. Wallis Kew to know my husband caught *Colias hyale* in 1868; the following year, 1869, *C. edusa.* In 1877 the edusa were very abundant in a clover field, not far from this house, which is near the river Nene. We did not see hyale, and have not met with a Colias since.—*F. S., Wisbech.*

Nasturtium.—Having this year grown some Nasturtium (order *Tropæolaceæ*), I have noticed at the bases of the blades of three of the petals, rather inclined inwards, about a dozen hairs on each. Could you, or any of yours, inform me what purpose they serve in the economy of the plant?—*L. Lee.*

Sand-Martins and their Nests.—A case of the persistence of birds to build in one place, occurred in Nottingham about six weeks ago. Nottingham is built upon what geologists call the Bunter Sandstone; which is well shown in a part of the town called the Park. The rock has five or six feet of soil on the top of it. A road was cut through a part of it some years ago, so that the soil and the sandstone were exposed. The martins found the soil and for several

years have built in it. For the purpose of making some stabling, a piece having about twenty-five yards frontage was cut back eight or ten yards, so as to leave a rectangular opening. The soil was first removed as far back as required; and next morning, when the men came to work, they found the birds busily engaged in excavating fresh holes in it, which they continued to do, and utilise for nests, all the while the men were removing the hard sandstone, which required the use of wedges and pickaxes to loosen it.—*L. Lee, Nottingham.*

GREAT GREY SHRIKE; LITTLE AUK.—The occurrence of both these birds is mentioned in the "Naturalist" for August. The former (*Lanius excubitor*), which is said not to have been hitherto recorded as occurring in Britain during the breeding season, was seen by Mr. Thomas Raine last June near Leeds. The dead body of a little auk (*Mergulus alle*) was found by Mr. J. Chaloner in July near Tadcaster.

SWARMS OF FLIES.—Have any readers taken note of the swarms of green flies which occurred during the summer? They were noticed in Ipswich on and near the 15th of July, and it was suggested that their presence was due to the comparative absence of swallows. They are reported in the "Entomologist" for August by Mr. G. E. Sims, jun., from Oxford, but the date is not given.

SILKWORMS.—I have for two or three years kept silkworms, but do not remember before noticing the following fact. In two cases a cocoon when opened has been found to contain two chrysalises. It has been impossible to unwind the silk from them, and it seems likely that the former silkworms had broken each other's threads in the process of spinning. The cocoons were certainly larger and flatter than usual. May I ask some one to inform me if this fact has often been noticed?—*Laurence G. J. Epps.*

TOYNBEE HALL.—"An Amateur Microscopist" writes as follows: I dare say some of the readers of SCIENCE-GOSSIP may have heard of the Toynbee Hall Institution in Whitechapel, and are aware that its object is the lessening of the wide gulf dividing the rich and the poor by social intercourse between the two classes, as represented by the workers of the Institution, who are connected with the leading Universities, on the one hand, and the poor inhabitants of the East End on the other. This is not the highest nor the most worthy of the objects of the Institution, but it is the one I propose dealing with in this letter. Subscriptions are now being received for the purpose of providing the Institution with a microscope, and, of course, objects will be required for examination and study. Now what I intend doing myself to assist this work and what I beg to suggest for the consideration of your readers, is as follows: when I am doing any mounting, I will, if possessed of sufficient material, mount an extra slide for the Toynbee Hall. This will give very little trouble, as it is as easy to mount two or three slides as one when the material is at hand. Hoping that I may have your approval and co-operation and that of your readers in this matter,—I remain, &c.

TOYNBEE HALL.—As I learn that "An Amateur Microscopist" is writing to you on the subject of the Toynbee Hall microscope, may I add a few words of explanation about the undertaking? The idea of a microscope for Toynbee Hall was suggested by a friend much Interested in that Institution, and the suggestion that some of us might send duplicate slides for exhibition was also in our favour. Thanks partly to the kindness of friends and partly to the lady students of Newnham College (who established a fund for this purpose) we have already collected about three guineas. We do not doubt that if a few of the readers of SCIENCE-GOSSIP would contribute a shilling or such small sum towards the fund, we should soon be in a position to send a really good microscope to the Institution, and perhaps to procure also a slide cabinet, which would be indispensable if donations of slides are to be of any value.—*G. H. Bryan, Thornlea, Trumpington Road, Cambridge.*

WHITE BUGLE.—In answer to Miss M. Jackson's query, I may state that I have preserved in my herbarium a *white* bugle (*Ajuga reptans*). It was found by J. Edmund Clark, B.A., B.Sc., in Helmsley, North Yorkshire, on June 4th, 1872.—*B. B. Le Tall.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

T. H. MARRIOTT.—Direct to editor under cover to publishers. Kill the insect first with benzole or chloroform.

W. C.—Articles not as a rule received on the condition you refer to. Write if you have anything to send otherwise.

EXCHANGE ITEM.—It is possible to look at this in a slightly different light. Neither of the terms of the exchange were closely particularised.

F. MARSHALL.—Yours is not an exchange.

J. M.—The remains of shells broken as you describe are said to be frequently seen.

MISS G.—The scale moss has apparently no fructification. The rush may be *J. acutiflorus* or *lamprocarpus*. Naming dried up specimens, especially when only part of the plant is sent, is apt to be unsatisfactory.

M. E. T.—Your caterpillar has become a chrysalis.

J. G.—One of the following might suit. "Popular British Fungi," by James Britten, F.L.S. (London: "Bazaar" Office), uncoloured figures; "A Plain and Easy Account of British Fungi, esp. esculent and economic," by Dr. M. C. Cooke. (London: late Hardwicke and Bogue), coloured plates; "Rust, Smut, Mildew and Mould—Microscopic Fungi," same author. (London: late Hardwicke), coloured plates. Prices unknown.

F. CHALLIS.—Dissolve shellac in naphtha, till it is as thick as cream. If the specimens are rough interpose cotton-wool.

M. E. T.—The dark-winged dragon fly appears to be the female of *Libellula splendens*. Both are somewhat injured.

JOHN HILL.—Your vetch was too dried when received to be of much good. Flowers packed in cardboard boxes are apt to be dried up in two or three days, and moisture may do harm.

J. TAYLOR.—The present number is the ninth of the volume. A volume contains twelve monthly numbers, beginning in January. For skeleton of bird or small animal, boil, but not too much, and remove the flesh. If small do not disunite the bones, but leave them attached by gristle. Details cannot be given here. Papers on plant-preserving have appeared in SCIENCE-GOSSIP, one of which is republished in "Notes on Collecting and Preserving Natural History Objects." As to your last query, write to the address given and ask.

R. H. WELLINGTON.—One of the minute fungi which are parasitic on cereals. Popular names for different kinds are "smut" and "bunt."

W. H.—Your box when opened (out of doors), on July 30, contained a most unsavoury mess, which had apparently infected the parcel in more ways than one.

EXCHANGES.

SEVERAL well-mounted slides of micro fungi, plant hairs, &c., for other well-mounted slides, or for books on microscopy and biology.—James W. Horton, Brayford Wharf, Lincoln.

A CAPITAL air-pump, worked by double rack and pinion movement, with receiver, &c., complete. Offers solicited.—Henry Vial, Crediton, Devon.

OFFERS requested for injected tissues of cat, rabbit, guinea-pig, and hedgehog, all carmine injected and first class.—Henry Vial, Crediton, Devon.

FIRST-CLASS microscopical slides offered in exchange for fresh healthy human tissues.—Arthur J. Doherty, 33 Burlington Street, Manchester.

HORNS of red deer, ibex, &c., for natural history books or specimens. Wanted, larvæ of Lepidoptera, birds' skins, shells, British or foreign.—S. L. Mosley, Beaumont Park Museum, Huddersfield.

WANTED, SCIENCE-GOSSIP, Nos. 193–200, 202, for 1881, in exchange for Lepidoptera, fossils, shells, &c.—A. Shepherd, 70 Brecknock Road, N.

WANTED, in exchange for books, vols. of "Bible Educator" (Cassell's), with the exception of first vol., Geikie's "Hours with the Bible," excepting first vol., or McChayne's "Memorials."—John Millie, Clarence House, Inverkeithing.

MICROSCOPE slides. What offers? Fishing-rod tackle and books on angling wanted; or a natural history.—Mr. Ebbage, 8 Lowfield Street, Dartford, Kent.

Wray's binocular microscope, 22 inches high, glass revolving stage and object-carrier, eye-pieces, 2 B's and a C (Wray's best), accessories, without objectives. Will exchange for monocular 3 in. microscope with objectives.—R. E. L., 9 Lorne Terrace, Fallowfield, Manchester.

AQUARIUM, octagon shape, slate bottom, good condition, size 16 in. high by 15 across, sloping top; would exchange a good parrot's cage or first-class microscopic objects; open to other offers except books or micro apparatus.—R. Mason, 24 Park Road, Clapham, London, S.W.

WANTED, Reeve's "Conchologia Iconica," those volumes on Unionidæ, Helicidæ, and parts on Melania and Rissoidæ. Offer, in exchange for any volume named, over 300 species American Unionidæ, Helicidæ, or Strepomatidæ.—R. Ellsworth Call, 619, 10th Street, W., Des Moines, Iowa, U.S.A.

REQUIRED, vol. xi. of "Nature," in any decent condition, in exchange for a selection to be agreed upon value from the following, which are all as good as new:—Trimmer and Dyer's "Flora of Middlesex," Asa Gray's "Handbook of Botany," Herschel's "Meteorology," Golding Bird's "Nat. Philosophy," Carpenter's "Microscope," Huxley and Martin's "Biology;" also one or more of the above list for a few specimens of corals, in good condition.—G. F. Nest, Jedburgh, N.B.

SIDE-BLOWN eggs, separate or in clutches, ring ouzel, Ray's wagtail, gray wagtail, rock pipit, goldfinch, redpole, brambling, for others.—Jas. Ellison, Steeton, Leeds.

DR. LANG'S "Butterflies of Europe," uncut, to exchange for birds' eggs, corals, or any natural history objects.—Jas. Ellison, Steeton, Leeds.

WANTED, 1437, 1552, 1553, 1229, 1222, 1618, 1292, 360. In exchange, 19, 1244, 800, 1504, 1293, 944, 1385, and others.—Rev. F. H. Arnold, Hermitage, Emsworth.

WANTED, books by F. O. Morris, Yarrell, or Bewick. Will give liberal exchange in miscellaneous works.—P. Payne, The Borough, Hinckley.

WANTED, Stark's "British Mosses." Will give good micro slides in exchange.—Samuel M. Malcolmson, M.D., 55 Great Victoria Street, Belfast.

WANTED, a good secondhand copy of Newman's "British Butterflies and Moths." Will give in exchange micro slides, natural history objects, &c.—F. R. Rowley, 60 Lower Hastings Street, Southfields, Leicester.

FINE specimens of *U. Margaritifer* from Yorkshire Esk. Wanted, Vertigo, *B. montanus*, also varieties of Unio, Anodonta, and Helix.—B. Hudson, 15 Waterloo Road, Middlesbrough.

WANTED, nests of lesser whitethroat, stonechat, tree-pipit, reed warbler, great tit, and blackcap, for side-blown eggs of coot, great tit, rook, herring gull, &c.—A. A. Shaw, Market Street, Ashton-under-Lyne.

EGGS of osprey, cuckoo, woodpecker, heron, grebe, gull, tern, and petrel, to exchange for others not in collection. Wanted, ornithological works, also any odd plates or numbers of old magazines or works on ornithology.—Dr. J. T. T. Reed, Ryhope, Durham Co.

WANTED, works on zoology, particularly Parker's "Zootomy," and those by Huxley. Will exchange Gibbon's "Imperial Stamp Album," containing about 425 stamps (many old and very rare), also small microscope.—Jas. Hornell, 123 Canning Street, Liverpool.

FOR exchange, skeleton of frog. What offers in micro slides?—J. Boggust, Alton, Hants.

BRITISH marine shells in exchange for the rarer land and freshwater shells. Wanted, Pisidium, Paludina, Hydrobia, Vertigos, &c. Lists sent.—A. Alletsee, 15 Roslyn Terrace, Redland, Bristol.

MARINE shells: *Cardium aculeatum, C. tuberculatum, C. echinatum, Bulla hydatis, A. pes-pelicani, Aplysia hybrida.* Many others, taken alive and in fine condition. Lists from—C. D. S., Maplewell, Loughborough.

OFFERED, a glass aquarium, 42 in. in circum., on stand; also "Knowledge" for 1884 and 1885, clean, unbound; or foreign shells, for book on geology or fossils.—George E. East, jun., 241 Evering Road, Upper Clapton, E.

LETTS'S Popular Atlas, latest edition, 4 vols., 156 maps, with index, unbound, in cloth cover. Exchange for geological books, fossils, &c.—H. P. Dodridge, 7 Wharton Street, W.C.

WELL-BLOWN eggs of mute swan, blackcap warbler, herring gull, great b. b. gull, less b. b. gull, com. gull, kittiwake, jackdaw, night heron, and puffin, for other good eggs. Unaccepted offers not answered.—W. H. Heathcote, 61 Avenham Lane, Preston, Lancashire.

DUPLICATES: *Pisidium roseum, Paludina contecta, P. vivipara, Planorbis lineatus, B. Leachii,* and a large number of other species. Rare or local shells, land, freshwater, or marine, wanted in exchange; also back numbers of the "Journal of Conchology." For any one species of the above send box and stamped label to—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

WILL exchange 2 doz. good histological specimens, well mounted, for a fox terrier, a dog.—Henry Price, 102 Munton Road, New Kent Road, London, S.E.

WANTED mounted slides of good diatoms, named, in exchange for living specimens of *Hydra viridis*, and *Alcyonella stagnorum*.—H. Relton, 5 Carlton Terrace, Low Fell, co. Durham.

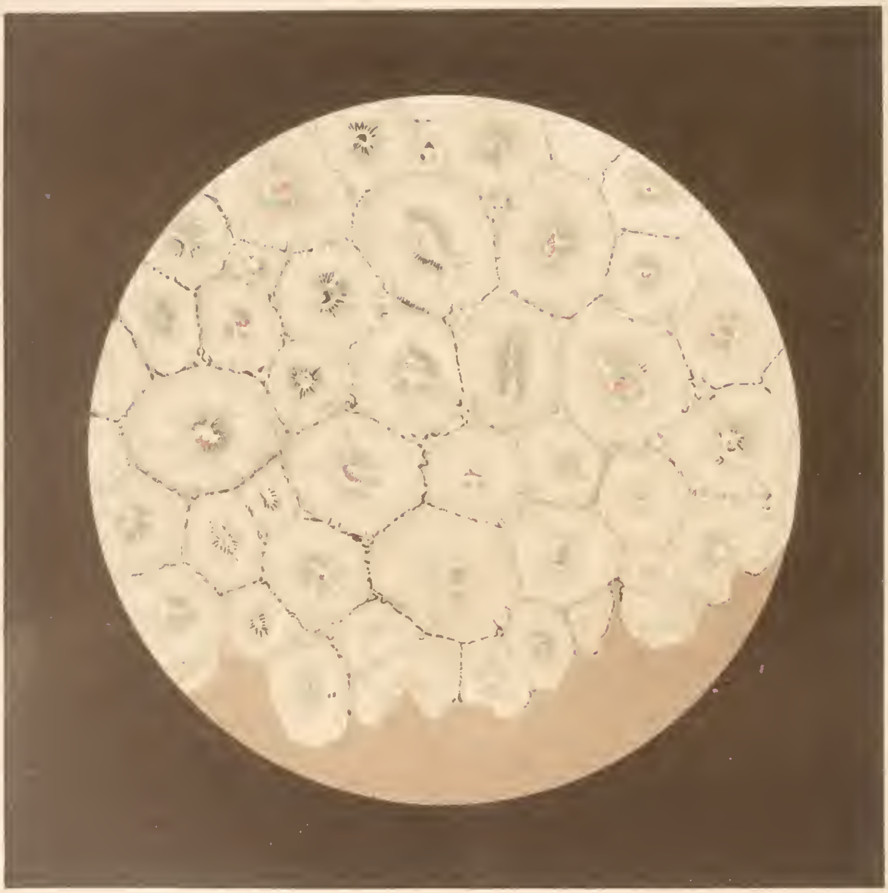
"ILLUSTRATED Carpenter and Builder," 6 vols. cloth, and Cassell's "Illustrated Russo-Turkish War." 2 vols., handsomely bound, offered in exchange for micro-slides, no anatomical.—R. Ridings, 1 Hampton Terrace, Lisburn Road, Belfast.

WANTED, shells not in collection, in exchange for *Sph. rivicola, Neritina fluviatilis, Pl. nitidus, Testacella hatiolidea, Limax lævis, Vertigo antivertigo,* &c.—F. Fenn, 20 Woodstock Road, Bedford Park, Chiswick, W.

BOOKS, ETC., RECEIVED.

"Scientific Romances, No. II.—The Persian King, or the Law of the Valley," by C. H. Hinton, B.A. (Sonnenschein & Co.).—"The Young Collector, British Butterflies, Moths and Beetles," by W. F. Kirby (Sonnenschein & Co.)—"A Tour in Sutherlandshire, with Extracts from the Field-books of a Sportsman and Naturalist," by C. St. John, 2 vols. (Edinburgh: David Douglas).—"Comstock Mining and Miners," by Eliot Lord (U. S. Geol. Survey).—"Contributions to the Knowledge of the Older Mesozoic Flora of Virginia," by W. M. Fontaine (U. S. Geol. Survey.)—"On the Quaternary and Recent Mollusca of the Great Basin," &c., by R. Ellsworth Call (U. S. Geol. Survey).—"Bulletins" of the U. S. Geol. Survey, Nos. 2–6.—"Transactions of the Essex Field Club."—"Journal of Proceedings of the Essex Field Club."—"Canadian Science Monthly."—"Proceedings of the Geologists' Association."—"Science."—"Canadian Entomologist."—"Ben Brierley's Journal."—"Bulletin of the Des Moines Academy of Science," vol i., No. 1.—"The Journal of Conchology."—"What is a Plant?" by H. W. S. Worsley-Benison, F.L.S.—"The American Monthly Microscopical Journal."—"The Asclepiad."—"The Geological Magazine."—"The Animal World."—"The Revival of British Industries."—"Once a Month" (Melbourne, Australia).—"Feuille des Jeunes Naturalistes."—"Annales de la Société Belge de Microscopie, 1883–4."—"The Naturalist."—"The Midland Naturalist."—"The Illustrated Science Monthly."—"A Dictionary of British Plant Names," by H. Purefoy Fitzgerald, (London: Baillière, Tindal & Cox.)—"Transactions of the Chichester and West Sussex Natural History and Microscopical Society," March, 1885.—"Testacella Cuvier," and "On Land and Freshwater Mollusca of Dorsetshire," by J. C. Mansel Pleydell, F.L.S.—"The Canadian Entomologist."

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—H. V.—G. F. N.—J. G.—J. B.—T. S.—W. E. C.—J. W. H.—J. M.—S. L. M.—T. B.—A. H. S.—H. R.—E.—W. W. I.—F. M.—T. P.—D. M. H.—A. S. M.—H. C.—B. L.—A. J. D.—J. T. K.—R. E. C.—A. L.—W. K. S.—H. W. S. W. B.—A. O.—W. H.—R. E. L.—F. J. W.—H. W. K.—W. C.—J. W.—T. H. M.—W. W. H.—A. S. W.—R. M.—Y.—S. M. M.—C. P—T. D. A. C.—C. G.—P. P.—F. H. A.—J. E.—W. LE T.—R. H. W.—E. G.—E. A. S.—F. R. R.—F. S.—F. P. D.—S. L.—M. H. R.—J. C.—D. B.—J. W. O.—G. R.—H. P.—F. F.—G. B.—W. H. H.—S. C. C.—W. H.—H. P. D.—J. B.—G. E. E.—A. A.—C. D. S.—J. C. S.—J. T. T. R.—A. A. S.—B. H.—J. G.—E. DE C.—R. R.—E. H.—G. H. B.—L. G. J. E.—&c., &c.



E. T. D. del. ad nat. Vincent Brooks Day & Son Lith.

T. S. OF TOOTH OF ANT EATER.

× 150

GRAPHIC MICROSCOPY.

By E. T. DRAPER.

No. XXII.—Transparent Section of Tooth of Ant-eater.

A FULL exposition of the general and comparative structure of teeth may be found in standard works of Physiology and ordinary text-books; but in explanation of the singular diversity of form and character in a mammal tooth as shown in the plate, it is necessary to describe generally the typical condition.

The teeth of vertebrates greatly differ in character, in the disposition of the tissues, structure, position, numbers, and adaptability, not only for seizing and macerating food, but as weapons of defence, attack, and instruments or tools subservient to the economy, and habits of the animal. They also denote age, sex, and are curiously adapted to the quality and character of food; to meet these and many other exigencies, their structures and condition necessarily divaricate into differences, to such an extent as to be subservient to use and functions; the shape, character and organisation of a tooth raises it to the importance of a zoological touchstone and element in classification, reaching the deepest researches of the palæontologist; every class of the vertebrata—fossil or recent—may be distinguished by the moulding and contexture of this organ; notwithstanding that in the complex creatures of past ages, strange approximations, and combinations of class, exist; the recognition of an extinct Batrachian, the Labyrinthodon, was determined by the character of the convoluted folds of the dentine of its tooth.

In the beautiful sections as now prepared for microscopical investigation, these differences are so admirably shown, as to raise them above "popularity," and elegant as they may be as attractive objects, to the student they are of deeper interest and educational value.

A typical tooth (human molar) may be said to consist of three constituents; in the centre a cavity enclosing a soft dental pulp, freely supplied with blood vessels and nerves; surrounding this is the dentine, the actual formed substance with radiating canaliculi, covered on the surface of the exposed parts by the enamel; surrounding the imbedded portion (the root or fangs) is a thin vascular structure, the cement, also rich in blood-vessels. A section cut horizontally would exhibit all these components; made transversely, the pulp cavity, the dentine, and enamel only would be revealed; such a preparation discloses a typical condition of the parts, but without deviating from the fundamental principle, varieties and modifications are found in lamination, solidity, contour, and distribution of the tissues. These diversities are found in every class, and extended modifications in species.

It is common knowledge that the horns of some animals, as the rhinoceros, are formed of a dense compressed mass of hairs, and the component parts of these compacted structures are easily distinguished by the microscope. Such cohesions are found in teeth, as seen in the plate. An infinite number, each with its distinctive character, may be aggregated into one mass; to external appearance it is a single tooth; on microscopical examination it is found to be a multitude locked together. This peculiar compound intertexture is common in the class of fishes, but somewhat rare in the mammalia. The object depicted in the plate is an instance of this peculiarity, and is thus described by Professor Sir R. Owen.

"Each tooth of the Cape Ant-eater (orycteropus) presents a simple form, is deeply set in the jaw, but without dividing into fangs; its broad and flat base is porous like the section of a common cane. The

canals to which these pores lead contain processes of a vascular pulp, and are the centres of radiation of as many independent dentinal tubules. Each tooth, in fact, consists of congeries of long and slender prismatic denticles of dentine, which are cemented together by their ossified capsules, this columnar denticle slightly decreasing in diameter, and occasionally bifurcating as they approach the grinding surface of the tooth."

The drawing represents a transverse section from the thickest part of a molar, and meeting the above description, displays, in the separating lines, the columnar denticles; in the centre, the pulp cavity, and in the intervening spaces the radiating dentinal tubules, the whole showing a curious example of a number of clementary teeth locked together, in fact, a compound tooth built of many into one uniform mass.

An interesting and singular example of a similar disposition of parts may be seen in a horizontal section of the incisor of a lemur, with the difference that a space exists between each denticle; although a combined tooth, they stand out alone, as free processes from the base to the crown, without adhesion; consequently a transverse section cuts them into separate and distinct pieces, each (as regards structure) a tooth in itself.

Sections of teeth should be prepared and mounted to meet every possible appliance for illumination.

Crouch End.

LEAVES FROM MY NOTE-BOOK FOR 1884.

By A. Kingston.

[*Continued from p.* 131.]

THE most notable circumstance during the month of May was the remarkable contrast between the severe frost at the latter end of April, and the summer heat which prevailed as early as from the 9th to the 12th of May. On the latter day the thermometer registered 80 degrees in the shade, while a correspondent from Doncaster gave a record for that day of 112 degrees in the sun, and it was certainly considerably upwards of 100 degrees in the sun, in many other places about mid-day on the 12th.

Few things in the botanical world were more remarkable, in the phenomenally dry summer of 1884, than the superabundance of the common red poppy (*Papaver Rhœas*), which brightened up many a broad stretch of cornfield with its ruddy glow, and in many cases outshining the green corn and producing a heavy crop of itself, which afforded employment to a number of young people and casual hands in collecting the flowers for use in drug distilleries.

From scarlet poppies to bats may seem a far cry, but, on a summer's evening at least, it need only be a question of looking up or down, so far as one of these curious "flying animals" is concerned. Early in the evening on July 18th, in the broad daylight, and some little time before sunset, the writer's attention was attracted by what, at a distance, appeared to be a number of swallows hawking vigorously for insects in the neighbourhood of a group of trees. On getting nearer to them they were found to be bats, from 12 to 20 in number, of the great bat (*Scotophilus noctula*). I am aware that there was nothing very extraordinary in the number seen together of a bat which is known to be remarkably gregarious, especially in its winter quarters. Indeed, it is I believe on record, that the large number of 185 were taken from beneath the eaves of Queen's College, Cambridge, in one night, and 63 the following night. I have included the reference to it in these notes as a confirmation of the curious fact, that this particular species of cheiroptera, which has been singled out from about fifteen species to receive the distinctive name Noctula, is remarkable for the very opposite peculiarity of coming out by daylight, and earlier in the evening than any other species!

It would have been singular indeed, if such an exceptionally hot and dry summer had not produced some effect in that universe of "scales, legs, and wings, and beautiful things" which make up the interesting domain of entomology. But passing over the unusual abundance of the common house-fly and the earwig, my notes refer chiefly to the lepidoptera. A passing notice must however also suffice for the exceptional numbers of the pretty orange-tip butterfly (*Anthocaris cardamines*), the variously coloured species of the Satyridæ, and the "blues," such as the charming little *Polyommatus Adonis*, to make room for a fuller reference to the fortunes of the better known *Pieris brassicæ*, or large white butterfly. In the autumn of 1883, the caterpillar of this butterfly was so abundant, that if this could have been conclusive evidence, horticulturists might have feared a direful visitation of white butterflies in 1884. But "there's many a slip," &c., even in butterfly economy. Probably owing to the absence of that peculiarly succulent condition of the cabbage tribe, which is so essential to this caterpillar's comfort, the larva of the large white butterfly was as remarkable for its absence last autumn as it had been for its abundance the previous year. In 1883, at one particular spot where the writer has been accustomed to watch their interesting transformations, about a score of caterpillars of this butterfly took up their positions and strapped themselves up to await the coming spring. But last autumn only one caterpillar was seen there, and the busy little ichneumon made short work of that one. Yet the conditions were just the same as to plants of the cabbage tribe within a similar distance. I mention the latter point as having some bearing upon the interesting question of butterfly instinct. It is perhaps too often assumed that the butterfly, having deposited its eggs on some object suitable for the food of its caterpillar, has

accomplished the purpose of its existence; and so it has, but may there not have been a previous element in the case? Even casual observers must have noticed that the further you get away from the homes and haunts of men, the more scarce becomes the white butterfly, while with many of the brightly coloured species the reverse is the case. This, *prima facie*, is of course only equivalent to saying that one finds the most suitable food for its larvæ in the garden, and the others in the fields and lanes, but the following incident will, I think, carry the point a little further. The most notable instance of the destructive operations of the caterpillar of the large white butterfly, which came under the writer's notice in 1883, was near a railway station on the Great Northern Railway, where a bed of plants of the brassica tribe (I think cauliflower) was completely denuded of every vestige of leaf, leaving nothing but the bare fibre and stalk of the plants. Two or three yards from the end of this cabbage bed, was a newly-erected waiting-room, constructed of wood from ground to roof. Up this structure the tribes of caterpillars went from the cauliflower bed in such numbers as to occupy every board in the roof! Forty or fifty yards away from this spot, but with no suitable hibernating quarters for the caterpillars to pass into the chrysalis state in, were similar cabbage-beds, but in this case the injury caused by the caterpillars was mild in comparison with the havoc wrought on the plants near the waiting-room. Was this predilection for the plants near the structure merely a coincidence? Or was it a recognition on the part of the butterflies, that the spot would afford the best chance of the caterpillars passing the chrysalis state in peace and comfort? Had the butterflies no interest in their progeny beyond providing them with proper feeding ground in the larva state, or did their instinct lead them to select a feeding-ground for one stage of their progeny near a suitable accommodation for the succeeding, or chrysalis stage? The point is one which might be of some interest in market gardening districts, or where cabbages, &c., are planted in open situations. To this note on butterflies I may add that, in August last, I put a specimen of the peacock (*Vanessa Io*) into a laurel bottle in which the leaves, though not very fresh, were sufficiently strong to at once stupefy the insect. When the time came for getting the specimen on to the setting-board I had quite forgotten my prisoner, and, being away from home for some time afterwards, I thought no more of the butterfly for more than a fortnight afterwards. On opening the bottle and taking out the butterfly, it flew across the room on to a table, and after a few exertions akin to a gasp (audible), apparently on account of the sudden change of atmosphere, it flew away in vigorous style over the neighbouring houses as if nothing had happened to it! I do not mention this as evidence against the use of the laurel bottle, because very much depends, of course, upon the frequency with which the laurel leaves are changed; but it shows how little the butterfly needs in the way of sustenance, in this the perfect stage of its existence, and how easily it can adapt itself to a different kind of atmosphere.

Reverting once more to ornithological subjects, the season of 1884 was somewhat remarkable for the free breeding of our fine old British bird the kingfisher, a circumstance probably due to the absence of floods; at any rate, taxidermists have rarely had such a harvest of kingfisher customers. When King James I. had a hunting box and stables (still in existence) in that neighbourhood for indulging his hunting proclivities, it is on record that his majesty frequently resorted to Royston, especially "at y^e^ season for shooting of dotterails, a sort of bird very common in these parts." I am afraid if his majesty could visit "these parts" now he would find the dotterell (*Charadrius Morinellus*) almost unknown; for it has now become very rare, and during the past year, as far as I can learn, has not been seen in its old haunts.

The welcome rainfall in September, with the warm weather which followed, produced after such an exceptional period of drought, some very curious manifestations in the vegetable kingdom, and led to not a few "strawberry" paragraphs in the newspapers, chronicling the abnormal appearance of ripe strawberries and apple blossoms at Michaelmas. The most singular instance of this kind which came under the writer's notice was a horse chestnut tree standing in the Hitchen market place, and which, though then divested of nearly every leaf, had quite a number of fine spikes of bloom upon it on October 21st. The large white butterfly was on the wing until about October 25th; the peacock and small tortoiseshell to the last day of the month, and the hardy passion-flower (*Passiflora cœrulea*) bloomed in the open air until the same date. About thirty species of wild flowers were in bloom up to the middle of November.

One incident, as a curiosity of natural history, may perhaps form a fitting close to the above record of odd fragments. It is not often that in the chapter of oddities among inferior living creatures, one comes across an incident embodying such an apparent sense of the ludicrous, or so much of the elements of a smart practical joke, as in the following case of insulting a scarecrow. The incident was narrated to the writer by Mr. Norman, the naturalist whose name I have mentioned above. Finding it necessary to put up something as a scarecrow, for the protection of a particular crop in his garden, he fastened up in a tree a dilapidated specimen of a stuffed fox. Exposure soon resulted in poor Reynard showing signs of decay; but imagine the owner's astonishment at the end of the summer, on finding that an impudent pair of fly-catchers had actually built their nest inside the scarecrow, and brought up their brood of young ones there!

SOME FERNS OF HONG-KONG.

By Mrs. E. L. O' Malley.

[*Concluded from p.* 178.]

Gen. XIII. Dicksonia (*Cibotium*), Kaulf.

CIBOTIUM is a small section of the genus Dicksonia, a genus including many tree-ferns. In the real Dicksonias the indusium is partly formed from the leaf itself; in the sub-section Cibotium the outer valve of the involucre is distinct from the substance of the

Fig. 146.—*Dicksonia Barometz*, Link. (*Cibotium glaucum*, Hk.)

Fig. 147.—*Brainea insignis*, Hk.

Fig. 148.—*Davallia tenuifolia*, Sw.

frond, and situated at the margin and in the sinus of the lobe.

Cibotium glaucum, Hk., is a large handsome graceful fern, the much-cut fronds and glaucous or white powdery hue on the under-side easily serving to distinguish the species. It may be met with in every ravine, varying in height from 1–10 feet, although never attaining to the dimensions of a tree. The rhizome—that portion of the rachis which runs along the ground, and is neither root nor stem—is covered with short golden hairs, and is occasionally to be found above the ground in quaint, curious forms which have been taken to represent animals. These portions of the root are sometimes to be seen hawked about the streets of Hong-Kong and called "Lamb-Fern"—the name employed for the same thing by classical writers of the olden times being Barometz, by which the fern is sometimes still called. Two tree-ferns are common: *Alsophila podophylla*, Hk., not nearly so finely cut as Cibotium and distinguished by the raised globular sori and rough scaly stem, and *Brainea insignis*, Hk., a smaller plant bearing the fructification closely packed on arched veins near the midrib. They are both pretty generally distributed throughout the island.

We notice in the last place one of the prettiest and commonest of the ferns of Hong-Kong.

Gen. XIV. Davallia, Sm.

Hares' foot fern—it has been called in conservatories at home where one species is very often to be seen. In many houses here the root (or rhizome, properly speaking) is trained into the shape of balls and rings, and the fern is hung up as an ornament in verandahs.

The common species is *Davallia tenuifolia*, Sw.

The frond grows from 1½ to 8 inches high, is a bright light green and shiny. The tiny divisions are much cut and wider at the top than at the base. The sorus terminates the margin of the lobe. There is no mistaking this pretty little fern. It may be found everywhere. When growing by the sea in clefts of the rock, or on granite shelves at Kowloon,

it is often succulent in texture and the stalk assumes a pinkish hue.

D. polypodioides, Don, is common in the hills. It is as graceful and delicate as the preceding, but larger and far more herbaceous. The pinnules are rounded at the apex, and do not bear the seed, which is situated in the sinus or cut between the lobes. The leaf is soft and downy.

The climate of Hong-Kong is not so well suited for the growth of ferns as some countries in the same latitudes further from the sea and with a damper atmosphere, for the moist heat of the summer is more than counteracted by the dry cold winds of winter.

But an attractive feature in the study of ferns is, that although not many representatives of a family may be forthcoming anywhere, a few species of the principal genera can always be found, and thus the student derives a general idea of what a wider field might contain. The wild flowers of China, for example, are wholly different to those of England, and the labour and difficulty necessary for their identifi-

Fig. 149.—*Davallia polypodioides*, Don.

cation and preservation beyond the powers of man'; but a spleenwort, a shield-fern or a filmy once known, there is no spot in the world where one of the brotherhood at least may not be recognised. The range is so limited, and the mode of collecting specimens so simple and easy, that the humblest lover of nature can indulge his taste in this direction. And we feel sure the trouble would be rewarded of making a few friends more in the fern-world by those who care to improve upon perhaps but a slight acquaintance. We have heard it said that enjoyment in the beauty of flowers and the like is diminished or even destroyed by any scientific or technical knowledge. We can only assure our readers that this is indeed not the case. No, let nature claim the intimacy which is so naturally hers, and we shall find that in a world where faces change, and friendships among our own kind are apt to cause sometimes more sorrow than joy, we shall be able to distract our thoughts and occupy our minds, and gladden our eyes and hearts, with the companionship of those silent though much loved friends ; and the better we learn to know them as we wander from place to place, and from country to country, the more steadfast will be the love we bear them and the more welcome the sight of their familiar faces.

Hong-Kong.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

THE "*carbonari*" (charcoal-burners) are a characteristic and rather important element of the population of Italy. In my adventure days I walked alone from the Alps to Calabria, and frequently fell among them. Their evil repute at first made me somewhat uncomfortable in their companionship, but I soon learned that, like our own navvies, coal-miners, and bargees, they are shamefully libelled by people who imagine that rough, hard, dirty work, is more demoralising than usurious money-lending and other genteel occupations of that class. Having so often deplored the ignorance, while admiring the natural shrewdness and geniality of these dark-faced fellows, I am glad to learn from the Society of Arts' Journal (August 14th) that there is an immediate prospect of their rude work becoming elevated, and with it the workers, by the introduction of scientific improvements, whereby the yield of charcoal will be doubled (the average hitherto has been but 15 per cent. on the original wood), and valuable bye products, such as gas, acetic acid, and tar, will be obtained. This has long been possible by using costly plant, beyond the reach of a carbonaro or an association of carbonari. The "Agricoltore Piceno" describes, in a recent number, a simplification of retorts and condensers that are likely to become adopted, even in the most primitive valleys. As charcoal is the common fuel of the country, used both for cooking and warming, the national importance of this is obvious. It is estimated that in the new process the bye products will pay the cost of labour, and the wear and tear of plant ; while the yield of charcoal is not only doubled in quantity, but greatly improved in quality.

In the early part of the year I placed a sitting of ducks' eggs under a hen, but only one was hatched. This was mothered and petted by all the members of the family, and became amusingly dog-like in its attachment. It is now full-grown, follows me about, comes when called, sits by my side when I am reading in the garden, and especially assists in my gardening work, its share being worms, slugs, &c. I have made some experiments on the food of this animal, experiments that have doubtless confirmed the attachment, and find that worms, snails, slugs, beetles and blatta of all kinds, and in all stages, spiders, wasps, bees, centipedes, and nearly every other living creature that is swallowable, is swallowed.

In the course of our co-operative agriculture we have occasionally disturbed a colony of ants. Miss Waddle made a dash at the first, but was sorely troubled ; shook her head most violently to throw them out of her mouth. Two or three subsequent attacks were made with like result, but now she understands them. The contrast between these and wasps is curious. The inhabitants of an unearthed

wasp's nest, both larvæ and winged warriors, were eaten with impunity, the duck's active tongue being evidently proof against their stings. I have little doubt that the venom of the ants is the formic acid they secrete. This punishment of the duck indicates plainly enough the use of this secretion. But for it a creature otherwise so helpless and wingless would be exterminated. Earwigs are similarly rejected, as though they also emitted a similar acrid secretion. Perhaps some of the readers of SCIENCE-GOSSIP who have caged specimens of insectivorous birds will be able to tell us whether ants and earwigs are able to defend themselves in like manner against these. I ask this question, having a vague impression that some such birds are occasionally fed on ants or their larvæ. The question of course applies to the complete animal, not to the larvæ of the ants ; these helpless babies being so carefully, bravely, and skilfully protected by their parents and soldiers.

On August 31st, Chevreul entered his hundredth year. Chevreul has been a brain-worker all his lifetime, and a hard worker, was assistant to the celebrated Vauquelin at seventeen, and published his first original paper at twenty, and more than a score of others during the next six years. It is said that he never drank a glass of wine in his life—a wondrous eccentricity in a Frenchman—and that he never wears a hat indoors or out of doors for protection's sake, only under conventional compulsion. A recent portrait displays a very abundant supply of natural head-covering, just thinning somewhat at the top, but spreading out exuberantly on each side.

He is still a worker ; only a year or two ago, he startled his brother academicians by coolly remarking in the course of some supplementary observations on a communication he had just read, "Moreover, gentlemen, the observation is not a new one to me. I had the honour to mention it here, at the meeting of the Academy of Sciences, on the 10th of May, 1812."

Talking of the mild winter of 1883, he remarked that the severest winter he ever experienced was that of 1793. Two years ago I purchased a copy of his book on "Animal Fats," commenced in 1813, and published in 1823, and read it with much interest and instruction. All that we know on this subject, and its very extensive applications in the art of soap-making, candle-making, lubricants, &c., even of "bosch" (artificial butter), is based on this treatise. I must not be tempted to enumerate his work, a mere list of subjects would carry me far beyond reasonable limits ; and there is the less need of this as I hope, twelve months hence, to record his completion of a century of admirable life, when popular biographical sketches will probably rain upon all readers. France may well be proud of such a citizen.

As all my readers know, the question of whether we should use "whole meal" or ordinary flour has of late been very warmly discussed. The whole meal advocacy is based upon chemical analyses, which prove that the envelope of the grain which is cast out from ordinary flour is very rich in nutritious material. This evidence, however, is insufficient alone. We require to know not only what this portion contains, but how much of it is obtainable as nutriment. The mechanical structure of the bran is not promising as regards digestibility, and further investigation appears to confirm the inference its structure suggests.

A paper on the subject by A. Girard was published, a few months since, in the current series of the "Annales de Chimie et Physique," page 289, containing the results of careful researches on the subject. The author tells us that the envelope of the grain constitutes 14·36 per cent. of the whole, and that it is rich in nitrogenous substances (18·75 per cent.), but they are incapable of assimilation by human digestive organs, the envelope of the grain passing through the body in a practically unaltered condition. He asserts that the brown colour of whole-meal bread is not merely due to that of the bran contained in it, but chiefly to the action of *cerealin* (a ferment discovered in the envelope of wheat by Meges Mouriès), which diminishes the plasticity of the gluten of the flour and gives it a brown colour.

A careful examination of brown bread will, I think, lead the reader to agree with me in accepting this explanation, as an ordinary brown loaf composed of a mixture of white flour and light buff-coloured bran, is darker than the bran itself, and is evidently *stained* throughout, not merely mottled by the bran particles. By comparing the colour of the baked loaf with the dough before baking, this difference is very obvious, and it confirms the statement of M. Girard, that the change of colour occurs during the baking.

When, however, he accuses the cerealin of doing mischief because it acts on starch in a manner similar to the action of diastase, and diminishes the plasticity of the gluten, I cannot agree with him, nor with his condemnation of the embryo or germ of the grain because it contains not only cerealin, but a highly oxidisable oil, which he says imparts the odour of rancid grease to the bread. My ground of difference here is : 1st. I cannot smell this rancidity. 2nd. If I could, it would prove the existence of something equivalent to butter ; and bread and butter approaches nearer to a complete food than bread alone. 3rd. The conversion of starch into dextrine by diastase is especially desirable. It must be done before the starch can be digested, is done by the saliva, the pancreatic juice and the intestinal juice, but is better done with the assistance of vegetable diastase, such as is contained in the germ of the grain (see "Chemistry of Cookery," Chapters XII. and XVIII., where I have more fully discussed these subjects).

I think therefore that M. Girard's conclusion, that only the inner farinaceous portion of the grain should be used for human alimentation, and that it should be the aim of the miller to completely eliminate from his flour all the other parts, is refuted rather than supported by what he tells us concerning the cerealin. On the other hand, the facts concerning the non-digestibility of the bran indicate considerable exaggeration in the claims of some of the whole-meal candidates.

Assuming that the cerealin does act on the starch and gluten as stated, it is a benefactor, and we may do well to retain the outer skin of the wheat for its sake alone, even though the other nitrogenous and mineral constituents may not be assimilable. Besides this, there is the physiological question of the stimulating action of such a husky material on the bowels to be considered. Is it good or evil? Evidently the whole-meal question is not yet settled.

I may add that Dr. Randolph has, in the "Notes from the Physiological Laboratory of the University of Pennsylvania," a paper on the nutritive value of branny foods. He concludes, after a prolonged course of experiments, that the carbohydrates of bran are digested by man in a slight degree only; but as the nutritive salts of wheat are chiefly contained in the bran, those who feed on bread alone should take it brown for the sake of these salts, while those who use other food supplying such salts should select white bread; and that in an ordinary mixed diet the retention of the bran is a false economy, as it quickens peristaltic action and thereby prevents the complete digestion and absorption, not only of the proteids contained in the branny food, but of other food matters mixed with it. To this I think the "bread reformers" may fairly reply, that the peristaltic movement is a part of the machinery of digestion, the promotion of which may be beneficial; it is certainly needed in some cases of sluggish action, and it probably increases the secretion of animal diastase (intestinal juice) in the intestines. On the whole, I am inclined to conclude that whole-meal bread is best for vegetarians, though perhaps not so for those who eat flesh.

The following letter from Dr. Keegan shows that the difference between us is still less than even his first letter indicated :—

Mr. Williams, in his reply (p. 200) to my remarks, dwells upon the savagery, brutality, and obtuse moral sense of some of Homer's heroes, and upon the general obscenity saturating (as he avers) much of the old classic literature. Now, the works of Homer are generally known to be a collection of legends relative to a social state far in the depths of human history, and therefore it may be doubted if their perusal is eminently calculated to demoralise persons reared in the light of more advanced and exalted ideas. With regard to the other matter, it may be replied, that a similar sort of immorality pervades, to some extent, the literature of every people in the world. The works of our own peerless dramatists of the time of Elizabeth and of Charles II. are not utterly free from a blackguardly indecency of a very pestiferous nature, written though they be in that "truly classic language which all mankind will eventually speak." Of the study of literature in general it may be observed, that therein we engage in the survey of the inner moving world of the human soul, and the more ideal and abstract (if at the same time moral) this be portrayed, the more humanising and morally edifying and beneficial it is in effect. In the study of the classic languages and literatures (notably the Latin), there is, in addition to this humanising element, the intellectual gymnastic, furnished by the various processes involved in the translation or constructing into English, or vice versâ. The eminent value of classical study lies, as it seems to me, in the combination of these two elements of culture. In the study of physical science, the humanising or moral element is wanting, or else feeble; in the study of our native literature the analytical intellectual faculty is not so vigorously exercised. No doubt there is what Professor Tyndall styles "an emotion of the intellect incident to the discernment of new truth;" but it is at best a rather dry and not very soft sort of sentiment. Indeed, Mr. F. Galton expressly avers that "the influence of scientific men is not directed to persons and to human interests, and they are deficient in the purely emotional elements," &c. I cordially endorse Mr. Williams's approval that physical science should be carried upwards to social and moral science, and I have read with the keenest interest his attestation anent the proceedings, in this particular, of certain worthy gentlemen and excellent scholars of Oxford. But Mr. Williams seems to include such studies as those of logic, metaphysics, moral and social science, in the same category with physical science. Most people will probably think that as regards educational efficacy they are widely different. The former are probably less humanising than literature and art; but they are of eminent value in this respect, and they are intimately allied thereto. Nevertheless, it would be idle to disparage the eminent utilitarian and intellectual benefits of the study and applications of physical science. Nobody nowadays yields allegiance to the ancient philosophy which, according to Seneca, teaches men "to be independent of all material substances and all mechanical contrivances." Our great aim should be that in the dispensation of this material knowledge its "celestial harmonies and breathings of paradise" be not utterly ignored and overriden. If only "the sublime consciousness of their own humanity" be more frequently stirred in the breasts of our eminent scientists, their influence over the age and the ignorant vulgar will doubtless be more elevating than it seems to be, and men would probably learn to reconcile forces (such as

religion, science, and practical work) which now seem diametrically opposed and mutually subversive.—P. Q. KEEGAN, LL.D.

I have only to add in explanation, that my objections to Homer and the poetry of the ancients apply especially to their use as school books. As historical records of one of the stages of human barbarism, they have great archæological interest, and the same may be said, in a minor degree, of the early English literature to which he alludes. In the dark ages when there was no other literature available, these old authors were desirable objects of study as literary models; but now that all the excellence of their art, minus the depravity of their morals, may be found in modern literature, I maintain that they should not be chosen for the education of youth.

Intellectual gymnastics are obtainable by the study of anything demanding intellectual effort. The manner of study has even more influence in this respect than the subject itself. Mathematics, physics, chemistry, biology, or moral philosophy may be degraded by mere rote cramming for examination's sake; the same with any language or any literature; or they may be taught intelligently and philosophically, and thus afford the highest mental discipline.

THE VARIATION AND ABNORMAL DEVELOPMENT OF THE MOLLUSCA.

PART III.

TERRESTRIAL GASTEROPODA.

ARION ATER.—A considerable number of forms occur; at Bedford Park, for instance, we find the type and varieties *rufa*, *succinea*, and *nigrescens*, as well as a form which does not agree exactly with *nigrescens* or *plumbea*, but is not distinct enough for a name; it is of a very dark slate colour, with a dark brown margin. The variety *albida* will probably turn up sooner or later, but I have not yet seen it. It has been found in Sussex and Herts.

At Chislehurst a form of var. *succinea* (yellowish, tinged with orange posteriorly, and with an orange margin), is found on the common among the brake fern and brambles; but in the old chalk-pit, in the lower Camden valley, amongst the coltsfoot, this form is replaced by the variety called *pallescens*, very pale yellow with an orange margin. Some of the little *Arions* are greenish, almost exactly the colour of the under-surface of a *Tussilago* leaf. The full description of one of these juvenile examples is: Tentacles dark brown, mantle yellowish-white, rather darker in front, body greenish-white, margin of foot yellowish-white.

A variety with a very dark brown mantle and a black body occurs at Chislehurst.

Arion hortensis.—A variable species, but (in our district at any rate) less so than *A. ater.* The ordinary banded form (called var. *fasciata* by Moquin-Tandon) is found at Acton, Chislehurst, Croydon, and many other places. The sole of the foot is sometimes of the most brilliant orange.

Some curious varieties are found at Bedford Park: one is larger than the ordinary form, and grey, with narrow lateral bands; another is dark above, and light at the sides, and others have already been described. Some very little ones were pale yellowish-red.

A number of Continental varieties of this slug have been described; one of the most interesting is var. *virescens*, which is greenish with black bands.

Arion, sp. ?—Intermediate in size between *A. ater* and *A. hortensis*; yellowish, inclining to orange, with brown bands placed in the same lateral position as those of *A. hortensis.* Three specimens under a log at Haslemere in company with *A. ater*, *A. hortensis*, and *Limax maximus.* I sent two of these to Mr. Roebuck, concerning which he writes as follows: "The Arions are of a very dubious sort, and I, like you, am uncertain what to call them . . . I have preserved your specimens in spirit, and pending the settlement of their *specific* name, I am calling them provisionally *A. hortensis* var. *subfusca.*"

They seem to be distinct from *A. hortensis*; and Mr. C. Ashford, who has dissected both these species, tells me that he finds slight but constant differences in their anatomy.

I have also taken this form at Chislehurst, where three varieties occur; the first is yellowish-white, the second purplish-brown, and the third yellowish-grey with a yellow margin.

I fancy that these *Arions* will be found all over the country in due time, and many of the records of *A. flavus* possibly refer to this species. I have recently found what I consider to be the true *Arion flavus* at Kingsley, Staffordshire. It is not unlike *A. hortensis*, from which, however, it differs in being orange-yellow on the sides and mantle and greyish on the back. There are faint lateral bands. The slime is orange-yellow and very thick. The sole of the foot is white and translucent. The respiratory orifice is a little in front of the central line of the mantle. Mr. W. D. Sutton, in the "Journal of Conchology," vol. i. p. 26, records what is evidently the same form from Northumberland and Durham; he says: "A variety (of *A. hortensis*) or possibly a species, nearly allied to this is found in woods. It is about twice the size of the garden slug, and its colour invariably yellowish fawn, inclining to amber, with a brown band on each side. The two kinds are not found mixed, one inhabiting the woods, and the other the cultivated grounds." However, I found the two kinds together at Haslemere, as stated above.

Limax agrestis.—In my notes I find recorded the following varieties:—

(1.) Entirely light brown. Kenley. Chalk pit at Croydon.

(2.) Purplish-brown. Chislehurst. This would come under *lilacina*.

(3.) Mantle brown with very faint mottling, body greyish-brown. Croydon and near Godstone.

(4.) Mantle mottled with grey, body reticulated with grey just behind mantle, but mottled behind, head and tentacles light brown. Croydon. Intermediate between *reticulata* and *sylvatica* apparently.

(5.) Body and mantle light brown, spotted all over with grey at somewhat regular intervals; head and tentacles darker than ground colour of body. Chalk pit at Croydon. Possibly allied to var. *punctata*, Picard, but not, I think, identical.

(6.) Body distinctly and beautifully reticulated. One at Acton, others less marked, and approaching nearer to type (var. 4). This would seem to be var. *reticulata*. One at Croydon.

(7.) Ground colour light brown, body and mantle

Fig. 150.—*Arion*, sp., Bedford Park, Chiswick.

Fig. 151.—1, *Hyalina glabra*, Jeff., Bromley; 2, *Hyalina cellaria*, Chislehurst. Showing the difference in the shape of the mouth, by means of which the two species may readily be distinguished. (Somewhat enlarged.)

Fig. 154.—*Leucochroa candidissima*, Bordighera, Italy. This species is by some writers called a *Zonites*.

thickly but irregularly mottled with black, mantle almost entirely black, except round respiratory orifice. A form of *sylvatica*. Croydon and Brentford.

(8.) Mantle light brown, body greyish without markings. Croydon. Probably identical with var. *filans*, Hoy, but hardly, I think, deserving a varietal name.

Limax arborum.—"The beautiful sea-green variety occurs in a garden on Bramley Hill, where a family of them lives in a hollow in an old oak" (K. Mc Kean).

Testacella haliotidea.—It would seem that all the British individuals of this species belong to the variety *scutulum*, which may ultimately prove to be a distinct species. At Bedford Park there are three fairly distinct colour varieties. They may be described as follows: (A) ground colour pale yellow. (1) without any markings = *pallida*; (2) with brown mottling on back and sides = *typica*. (B) ground colour orange = *aurea*. In *aurea* the mottling is as in the type form, and the orange of the sole is particularly vivid.

Various varieties are found abroad. The Rev. J. W. Horsley has taken some at Gibraltar, which may be called *scutulum*, sub-var. *albida*, for they were pure white.

Succinea Pfeifferi.—I have taken an almost scalariform specimen at Bromley. Var. *brevispirata*, Perivale, Middlesex.

S. virescens.—Specimens of this species from St. Mary Cray have the animal light in colour.

S. elegans.—My brother has found some remarkably elongated specimens at Minster.

J. Hazay, in the German Journal of Conchology for 1881, gives a list of the species and varieties of *Succinea* Mrs. Fitzgerald has sent him from England. Among them he mentions the following—*S. putris* var. *globuloidea*, Cambridge; var. *Charpentieri*, Notts; var. *limnoidea*, Dublin; var. *Ferrussina*, Matlock; var. *Fitzgeraldiana* (var. nov.), Folkestone; *Succinea elegans*, type form, Essex and Deal; var. *Baudoniana*, Yorkshire; sub-sp. *S. Pfeifferi*, type, Folkestone and North Wales; var. *elata*, Cornwall; var. *contortula*, Yorkshire; sub-sp. *S. suecica*, Cheshire; *S. oblonga*, type and var. *humilis*, Cork. It would, however, be desirable to obtain speci-

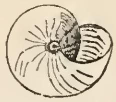


Fig. 152.—*Hyalina Draparnaldi*, Clifton, Bristol.

Fig. 153.—*Hyalina nitidula* var. *fasciata*, West Northdown, Thanet.

mens of these varieties for comparison before admitting them into the British list.

Vitrina pellucida.—Not a variable species. My largest specimen is from Beckenham.

Hyalina.—The species of this genus are placed under *Zonites* by writers on British Conchology, but, nevertheless, I would reject that generic name for our British species in favour of *Hyalina*, Albers, and for the following reasons. The type of the genus *Zonites* is *Z. algirus*, L., a species totally unlike any of our British species, inhabiting the south of France, and ranging, it is said, to Constantinople. Kobelt gives fourteen species of *Zonites* proper, none of which are found in England, but have their home in south-east Europe. On the Continent, and I believe, in America, the so-called British *Zonites* are all placed in *Hyalina*, except *fulvus*, which is sometimes placed in a sub-genus *Conulus*. It is obviously essential that we should, if possible, use the same nomenclature as foreign conchologists, and when there is a difference of opinion, that of the majority should prevail, but as those who use *Hyalina* abroad are many more than those who use *Zonites* in Britain, it is hardly reasonable to expect them to change their name to please us, and all that remains is for us to adopt *Hyalina*.

The late Dr. Gwyn Jeffreys once wrote to me on this subject, he said: "I cannot accept the subgeneric name *Hyalina* or *Hyalinia*. . . *Zonites* represented by *Z. algirus* does not in the least differ from *Hyalina*. . . By the rules of the British Association,

adjective generic names (such as *Hyalina*) cannot be used."

Now as to *Z. algirus* not differing from *Hyalina*, Continental authorities are fairly well agreed that it does sufficiently to warrant a separate generic name, and I cannot help thinking likewise.

With regard to the other argument, it is absurd to suppose that the "rules of the British Association" are going to bind down foreign authors, and besides, what about *Succinea?* Nevertheless, Dr. Jeffreys' opinion is one that should not be lightly ignored, and so it will be interesting to see if any evidence can be brought forward against my view of the case.

I am greatly indebted to Mr. Ponsonby, of Halkin Street, for the opportunity of seeing his valuable series of British *Hyalinæ*, many of which have been sent to Dr. Boettger in Germany, and which have been returned with the names affixed to them, according to his view of the question.

Hyalina cellaria.—Common throughout the district. My largest specimen is from Kenley in Surrey, it is about three-eighths of an inch in diameter. This species resembles *Hy. Draparnaldi* closely, but I think they are distinct. The latter has not yet been found in our district. Var. *compacta*, Jeff., has been recorded. Var. *albinos*, Minster and Kenley.

Var. shell greenish-white and transparent. One at Maidenhead, a few on a mossy bank (the moss was, I believe, *Polytrichum commune*, L.) by the side of the high-road, between Wrotham and Eynsford. When I first found the single specimen, which was immature, at Maidenhead, I identified it as *alliaria* var. *viridula*, Jeff., as it had a strong garlic odour; but I find that the young of both *cellaria* and of *glabra*, Jeff., have a garlic odour, and as the shell is in shape exactly like a young *cellaria*, and like the more mature Kentish examples of the greenish var., I am obliged to refer it to *cellaria*.

I have referred the Maidenhead specimen to Dr. Gwyn Jeffreys, and he returned it with the note "The variety of *Zonites cellarius* is my *albida*." This being the case, it would seem that the milk-white and opaque var., which would also, I suppose, be var. *albida* (I have referred to it above as *albinos*, Moq.), is not to be separated from the greenish and transparent form.

Hyalina glabra, Stud. (Jeff.).—Mr. Ponsonby submitted some of these to Dr. Boettger, who returned them as what the German conchologists called *alliaria*, and some of our British *alliaria* he called young *cellaria*, others young alliaria=*glabra*, Jeff., and another British specimen he identified as *Hy. petronella*, Charp. Moreover, he sent some of what he called *glabra*, Stud., to Mr. Ponsonby, and these were, without doubt, perfectly distinct from the *glaber* of British conchologists. From this it seems that there is a great gulf between the British and German notions of the species of *Hyalina;* which we are to adopt seems uncertain, but it seems extremely desirable that the matter should be cleared up. Jeffreys considered *H. petronella* to be the same as *Hy. excavata* v. *vitrina*, but Dr. Boettger's specimen is very different from this. In the British Museum some examples of *Hy. glabra*, Jeff., stand as *alliarius*.

I have taken *glabra*, Jeff., in Kent and Surrey, in which counties it would seem to be abundant, but I fancy it does not occur in the Isle of Thanet. One specimen at Hanwell (S. C. Cockerell). I found a greenish-white and transparent variety (*viridans* of my note book) at Bromley, Kent.

Hy. nitidula. Common throughout the district. Var. *Helmii*, this is the white form; *alba* would have been a much better name for it than *Helmii*. Near Chislehurst, but rare. I found a curious variety at West Northdown, Thanet, having four whorls, the last whorl expanded, and shell larger than usual, and of a dull waxy appearance, slightly whitish beneath, and having a rather broad brown band below the periphery; band formula 00005.

Hy. pura.—The so-called "type" seems to be less common than the var. *margaritacea*, which is white. As far as I can remember, I have taken the type only near Godstone, Surrey, but I have found the variety at Farnborough, Addington, near Dorking, near Shiere, Haslemere; and Mr. Ponsonby has a specimen from Leatherhead.

(*To be continued.*)

CHAPTERS ON FOSSIL SHARKS AND RAYS.

By Arthur Smith Woodward.

IV.

Petalontidæ, continued.

[*From page* 156.]

CLOSELY related to *Petalodus*, and from the same geological horizon, is *Ctenopetalus*, which differs in the shape of the root and the coarseness of the serrations; and not far removed, also, is the curious *Polyrhizodus*. This tooth (fig. 155) differs chiefly in being stouter and larger, in the absence of serrations on the cutting edge, and in having the root divided into a number of "radicles." Nothing is known of the arrangement in the mouth of either of these forms, and we are thus left to supply the deficiency by inference.

Proceeding to *Petalorhynchus*, which is also a Lower Carboniferous genus, we find the fossil remains a little more complete and instructive. Numerous specimens have been obtained from the Mountain Limestone of Armagh by the Earl of Enniskillen, and Mr. J. W. Davis published the results of his study of them in the Trans. Roy. Dublin Soc. for

1883.* These teeth are of the same general type as those of *Petalodus*, but differ in several respects, and are notably longer and narrower, with the crown more spatulate. When one of them became useless in the mouth of the fish, and its successor was ready to come forward for active service, the old tooth did not fall out, but was always retained beneath the new one as a support; as the creature approached old age, the tooth in use had thus a considerable series of worn-out predecessors beneath it, and these seem finally to have become more or less anchylosed together. Such series are not unfrequently found in the Armagh limestone, and one consisting of five teeth is represented in fig. 156; the lower and smallest tooth evidently indicates a young stage of the creature's existence, and as the mouth enlarged so did the dentition. The fact that some of these rows are symmetrical, while others appear "lefts" and "rights," suggests that they were originally ranged alongside each other; and there is reason to believe that one median tooth was present, with three on each side, but absolute proof is yet wanting of more than one pair occurring besides the median.

Still more interesting and satisfactory are the remains that have been discovered of the genus *Janassa*. This is typically a Permian form, often met with in the Kupferschiefer and the English Marl-slate, but the researches of Messrs. Hancock, Atthey, and Barkas have revealed numerous beautiful examples in the Coal Measures of Northumberland and Durham, and Mr. John Ward has also recorded a few scattered relics from North Staffordshire. It ought to be remarked, however, that the Carboniferous forms were originally described under a distinct generic name, *Climaxodus*, and are often quoted thus; but there seems to be no doubt as to their identity with *Janassa*, and Münster's *Dictæa* is now likewise considered synonymous. Each tooth consists both of a cutting edge (fig. 158, *a*), and a crushing surface (*ib.*, *b*), and, like other Petalodonts, possesses a well-developed root (*ib.*, *c*). The dental armature of the mouth consisted of five of these teeth, ranged side by side, and flanked by a pair (fig. 157) that are indistinguishable from *Petalodus*, except perhaps in their obliquity; this arrangement is shown in fig. 157, taken from an elaborate memoir by Messrs. Hancock and Howse in the "Ann. & Mag. Nat. Hist." for 1869 (vol. iv. ser. 4). The vertical disposition of the teeth and their mode of succession is also known, and the same palæontologists published the illustrative diagram copied in fig. 158, from which it is obvious that, as in *Petalorhynchus*, the successive new teeth must have arisen from behind, and, on coming forwards, not caused the old ones to fall out, but have rested upon and utilised them as a support.

Taking into account these various well-ascertained facts, we arrive at the conclusion, that although the teeth themselves are more like those of sharks than rays, their arrangement in the mouth agrees most closely with the dentition of such typical rays as *Myliobatis* and *Zygobatis*, and the Petalodonts must thus be looked upon as probably intermediate forms. Something like a transition from cutting teeth to crushing teeth may even be noticed in the family itself, for *Petalodus* (Carb. Limst.) is exclusively laniary, *Petalorhynchus* (Carb. Limst. and Yoredale) makes a slight approach towards the development of a tritoral portion, the so-called *Climaxodus* (chiefly Coal Measures) is adapted for both purposes, and the front cutting edge in some specimens of the Permian *Janassa* becomes almost obscured.

The curious teeth known as *Ctenoptychius* (fig. 159) and *Harpacodus*, also, most probably belong to the Petalodontidæ, and are both Carboniferous genera, the former ranging throughout all divisions, and the latter being exclusively confined to the lower. No definite evidence of their mode of disposition in the mouth has yet been obtained, and it ought to be remarked that certain small club-shaped fossils, originally referred to a species called *C. unilateralis*, are most likely not teeth at all, but Labyrinthodont scutes.*

Pristiophoridæ.

According to Dr. Günther, this small family is only represented at the present day by species of the genus, *Pristiophorus*, which exist off Australian and Japanese coasts; these are little Selachians, with the snout much prolonged as in the next family, the "Saw-fishes," but having the gill-openings lateral. Fossil forms are rare, and the only important genus usually referred here is the remarkable *Squaloraja* of the Lias. A partly restored sketch of this fish is given in fig. 160, and among its many peculiarities may be specially noted the cephalic spine (*ib.*, *s*), first described by Mr. William Davies, of the British Museum.† When a complete specimen is met with, this spine is generally so compressed and bent down upon the snout as to be rendered inconspicuous, but it is sometimes found detached, and occasionally (probably in females) it appears to be absent. The vertebræ are usually nothing more than calcified rings, and parts of the body are provided with dermal tubercles.

Pristidæ.

The "Saw-fishes" constitute a small family of rays, chiefly inhabiting tropical seas at the present day, and seem to have left no undoubted traces of their past existence in strata of an earlier period than the Eocene. They are particularly remarkable for

* In this work will be found a full account of the Petalodontidæ, with references to previous literature.

* T. Stock, "Ann. and Mag. Nat. Hist." [5], vol. viii. 1881, pp. 90–95.

† "Geol. Mag.," vol. ix. (1872), pp. 145–150, Pl. IV.

the possession of a greatly elongated snout (fig. 161), having the form of a nearly flat blade, and armed with a row of teeth fixed in sockets on each edge. More or less imperfect fragments of this powerful weapon are the only fossil remains ordinarily met with, and all these at present known evidently belong to the living genus, *Pristis;* they occur in the Tertiary formations both of Europe and America, and the Middle Eocene of Bracklesham has yielded some good examples. Of the latter, the most common are detached rostral teeth (fig. 162), but a few specimens of the snout itself are also known, and two interesting fragments are exhibited in the British Museum. These fossils are referred to about four species, but the most important are *P. Hastingsiæ* (fig. 162), and *P. contortus*—the latter with the rostral teeth slightly twisted.

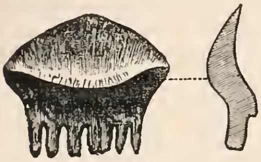


Fig. 155.—Tooth of *Polyrhizodus radicans*.

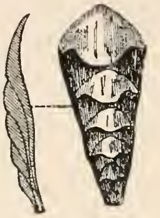


Fig. 156.—Teeth of *Petalorhynchus psittacinus*.

Fig. 157.—Dental series in jaw of *Janassa*. (After Hancock and Howse.)

Fig. 159.—Tooth of *Ctenoptychius pectinatus*.

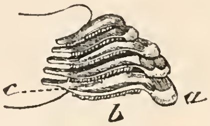


Fig. 158.—Diagram showing succession of teeth in jaw of *Janassa*. (After Hancock and Howse.)

Fig. 162.—Rostral tooth of *Pristis Hastingsiæ* (half nat. size).

Fig. 163.—Dermal tubercle of *Raja antiqua*.

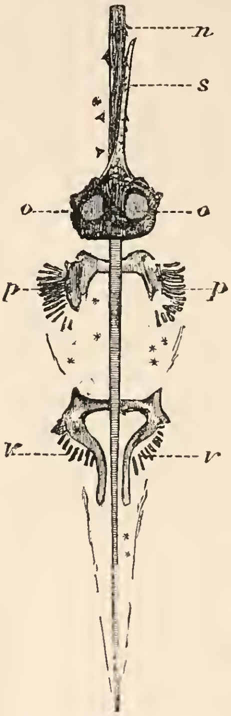


Fig. 160.—Sketch of skeletal parts of *Squaloraja polyspondyla* (one quarter nat. size). *n*, rostral prolongation; *s*, spine; *o*, orbits; *p*, pectoral fins; *v*, ventral fins.

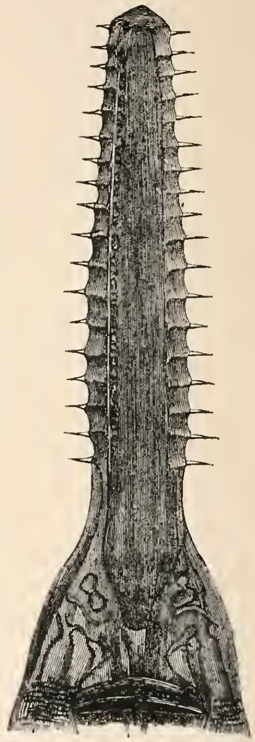


Fig. 161.—Lower aspect of head and rostrum of *Pristis*. (After Owen.)

RHINOBATIDÆ.

The Rhinobatidæ do not appear to be represented in British formations, but their remains, as found in the Lithographic Stone (Upper Oolite) and later deposits on the Continent, are among the most beautifully preserved of fossil Plagiostomes. They possess no dorsal spine, and the body is not so depressed as in the most typical rays, but there is a relatively long and slender tail. *Spathobatis* is an Oolitic genus, and the living *Rhinobatus* first occurs in the Cretaceous of the Lebanon.

TORPEDINIDÆ.

The "Torpedoes"—remarkable, as is well known, for their power of producing electric shocks—are represented at the present time by several genera, chiefly in tropical and sub-tropical seas, but the palæontological record has hitherto revealed only very few of their extinct progenitors. None are known to occur in British strata, but a very perfect example, from the Cretaceous rocks of Mt. Lebanon, was described long ago by Sir Philip Egerton,* and a few similar relics have been met with in the Eocenes of Monte Bolca, near Verona.

RAJIDÆ.

This is the family of Rays-proper, comprising several genera that agree in possessing a much-depressed body, more or less protected by hard

* Proc. Geol. Soc., vol. iv. (1884), p. 446, pl. V.

dermal granules or spinous tubercles, and characterised by the absence of a caudal spine. But, although these fishes exist at the present day in considerable nambers and have a remarkably wide geographical range, very little is known of their past history. The Lower Lias of Lyme Regis yields some fragmentary fossils (*Arthropterus*) that have been thought to be properly placed here, and a few doubtful indications of other members of the family have been noticed in later Mesozoic formations, but among British rocks, the Pliocene Crags appear to be the only beds containing reliable evidence, and this consists merely in detached dermal tubercles. The fossil tubercles (fig. 163) resemble so closely those disposed upon the back of the recent *Raja* (vol. xx. fig. 101, p. 173)—the genus to which the Common Skates and Thornbacks belong—that they have been referred to it by Agassiz, and distinguished under the specific name of *R. antiqua*.

TRYGONIDÆ.

So far as known, the "Sting-Rays" are unrepresented among British fossils, and do not appear to have been met with on the Continent in strata of an earlier date than the Eocene. These forms clearly exhibit the more important characters of the family as at present developed, and belong to still-existing genera.

(*To be continued.*)

ERYTHROXYLON COCA.

By H. WHITTAKER, F.S.Sc.

A LEADING article in the "Globe" of April 22 brings the *Erythroxylon coca* under our notice. The occasion of this article was an incident in a lecture at Madras by Dr. Bidie; viz., that, in the last famine, he had noticed many of the suffering natives eating considerable quantities of devadru, a plant which belongs to the same family as *Erythroxylon coca*. It appears that of late this plant has attracted the attention of medical men, who have, as the "Globe" remarks, "recognised the merits of cocaine (the active principle of the herb) as an anæsthetic, more especially in ophthalmic operations." Any medicine that has the property of subduing the intensity of pain attendant upon perhaps all surgical operations, is sure to be welcomed, and will undoubtedly receive that searching examination and keen criticism it is in the power of the medical profession to bestow.

Should the researches of eminent men confirm the opinion which is at present held by some touching the therapeutical value of the coca, doubtless it would be a good thing, not only for the profession, but also for the planters in India. It appears that the *Erythroxylon monogynum* (the scientific name for devadru) is a native of Cuddapah, in India, and the presumption is that the *Erythroxylon coca* may "easily be grown there with success."

The cultivation of the coca would be an immense boon to these people, whose realisations from coffee-planting are not as great as formerly.

Up to the present, however, opinions of experimentalists have not, unfortunately, been unanimous. Glowing accounts are given by some of its wonderful sustaining power, of the pleasant sensations or phantasmagoria produced by its internal use, and of its tonic influence on the nervous system, while others derive no such sensations, not "even that exhilaration which is produced by a draught of spring water." The testimonies of those who have made the coca the subject of personal study and experiment are diametrically opposed to each other. Professor Brown says: "It stimulates the stomach and promotes digestion. In large doses it augments animal heat and accelerates the pulse and respiration. It induces slight constipation. In moderate doses (one to four drachms) it stimulates the nervous system, so as to render it more tolerant of muscular fatigue. In larger doses it gives rise to hallucination and true delirium. Its most precious property is that of inducing the most pleasant visions without any subsequent depression of the nervous energies. Probably it diminishes some of the secretions." He evidently considers it of the greatest value in nervous diseases, on account of the tonic power it apparently possesses.

It is said that the Indians, after chewing a few leaves of the coca plant, can perform an extraordinary amount of labour. They also take it in very large doses, which act as an intoxicant, producing somewhat the same effect as opium or hasheesh. The pedestrian Weston is said to have used this plant, probably in infusion, but the writer is under the impression that this rumour has been contradicted.

Professor Bentley, F.L.S., in his excellent work on Botany, says: "The leaves of this plant are much used by the natives of Peru, and some other parts of South America, as a masticatory. The Peruvian Indians have always ascribed to the coca the most extraordinary virtues. Thus, they believe that it lessens the desire and the necessity for ordinary food, and, in fact, that it may be considered as almost a substitute for food . . . Dr. Weddell, however, speaks far less highly of its virtues. He states that it does *not* satisfy the appetite, but it merely enables those who chew it to support abstinence for a length of time without a feeling of hunger or weakness . . . In France a tonic wine is made from the leaves. Coca is deserving of an extended trial in this country as a medicinal agent," &c.

The writer experimented with an infusion of the leaves, but perceived none of the effects usually ascribed to the drug. This diversity of opinion may perhaps be explained by the following considerations.

Possibly the coca requires to be taken in a concentrated form, such as a tincture, or fluid-extract. True, the alleged effects of the drug are said to be produced by merely chewing the leaf, probably in its fresh condition. It must be remembered, however, that the green leaf of this plant is not to be readily obtained in this country; or, if obtained, the influences of this climate may have such an effect upon the coca as to deprive it, to a certain extent, of those properties peculiar to it when used in a fresh and native state.

The strength of the preparations used by the different experimentalists may not have been uniform, so that the weaker infusion or tincture, as the case may be, would not be likely to produce the same effects the stronger preparation would have upon the system. Then a mistake may have arisen as to the plant itself. Were the leaves from which the preparations were made genuine leaves of the *Erythroxylon coca?* It is very difficult to obtain the pure article; much that is spurious is to be found in the market. At present the genuine plant commands a very high price, and a low-priced article may at all times be looked upon with suspicion. However, it yet remains for the scientist to continue his researches in the direction of ascertaining its therapeutic properties.

The coca grows to the height of between three and four feet. It has white flowers and bright green leaves. It belongs to the natural order Erythroxylaceæ, and is one of the most important plants of that order. It is found chiefly in Peru and Bolivia.

NATURAL HISTORY JOTTINGS.

A Lizard throws off its Tail; and Earthworms feed.

MAY 30th.—This forenoon, I was agreeably surprised to see a fine viviparous lizard (*Zootoca vivipara*) quietly basking in a dry-stone dyke fully exposed to the bright and very hot sunshine. To all appearance it was a pregnant female, and had probably laid itself up thus to further the evolution of the young. Wishful to secure the lizard, I cautiously brought down my walking-stick upon it, pinning it to the spot upon which it basked; and on laying hold of the tail with my free hand, and bringing it forward to enable me the better to secure my prize without getting an unpleasant nip from its minute but sharp teeth, I had most of that organ thrown off and left twisting and writhing in my hand. Still keeping the creature pinned down with the stick, I dropped the portion of tail presented me, and was treated to a sight of what I have often read as obtaining in the slow-worm (*Anguis fragilis*), namely, the severed tail writhing and jumping about in the grass at my feet like a thing endowed with life. These motions continued for perhaps a couple of minutes, during which period the severed tail would pass over nearly a foot of ground. The portion of the tail thus thrown off, or broken off, was three inches long, and there yet remained attached to the trunk fully one-half inch more: the total length of the lizard, including all its tail, was 6⅝ inches. A little blood flowed from the wound caused by the severance of the tail.

I dare say I would be somewhat rough in my handling of the captive, but certainly not so rough as to tear off the tail, which from accounts is not infrequently thrown off voluntarily by other species of the lizard kind to confuse and mislead an enemy; and I see no reason to doubt that in this instance the lizard voluntarily threw off its tail for that purpose.

As I wished to make some further observations on the lizard, I boxed it (as well as its tail), and ultimately placed it in a large glass vessel. I kept it a day or two; but—ah, well! we are not all born naturalists, and "What's bred in the bone is ill to drive out of the flesh." I therefore again boxed my tailless captive and gave it its liberty in a suitable locality where it was shortly lost sight of; and I have since speculated on the possibility of this self-mutilation for protective purposes becoming intensified in the subsequent offspring of this individual. Had it been a placental mammal instead of an ovo-viviparous reptile, I should scarcely have doubted that the habit would have been intensified in the immediate offspring.

By the way, have we not in the above north-country form of an old proverb full acknowledgment and open confession of the law or principle of inheritance, of the transmission from parent to offspring of characters and idiosyncrasy, long ago grasped by the popular and perhaps more especially by the agricultural mind! Other proverbs there are of the same import; such as "A chip off the old block"; "Like parent, like child"; "That which comes of a cat will catch mice"; "That which is bred of a hen will scrape." Moreover, in every-day conversation you find the principle of inheritance admitted and enforced.

June 16th.—At about 6.30 P.M., while rain fell softly and the air was mild, I observed numbers of very large earthworms searching for food in the grass of a hedgeside, their tails remaining in their burrows while their heads and bodies were projected in search of food. The food which to appearances is most acceptable to them is dead or dying hawthorn leaves and blades of grass in the same condition. Twice I saw a fallen, discoloured small hawthorn leaf secured by, apparently, the invagination of a portion of the pointed muzzle, after which the worm withdrew into its burrow out of sight, for the purpose undoubtedly of consuming it. Also, I saw a discoloured blade of bent-grass that was still firmly attached to the parent plant, taken hold of by the process of invagination, and the secured portion detached by

the fibres of it being apparently rasped through longitudinally, by being alternately engulfed by this invagination of a considerable portion of the pointed muzzle and again disgorged by an opposite process. A small, detached trifoliate leaf of the crow-pea (*Lotus corniculatus*) was also seized by a worm, and the muzzle invaginated until most of the leaf was out of sight; this leaf was again disgorged and again swallowed, the alternate action being repeated a few times, and finally the leaf was entirely rejected and other food searched after. On picking up and examining this leaf I found it, though detached, quite fresh, and with the extremities of its three leaflets gnawed, whilst a small hole, gnawed apparently, also existed in one of them. Had this leaf been detached by another earthworm, and partly consumed—rasped down—by it? Why was it finally rejected? Possibly it had been previously attacked, gnawed and detached by a snail or a slug, both these creatures being out in force this evening, the large black slug being very observable amongst its congeners; and this latter mollusk, I have observed, can very effectually mow down soft vegetable tissues with the rhythmical sweep of its lingual ribbon.

June 18th.—In the evening after a heavy rainfall accompanied by lightning and thunder, when it had faired up, and though dull was otherwise fine and mild, a large (half-acre) garden was literally alive with earthworms, mostly of large size, some indeed of enormous dimensions. At dusk they became still more numerous, their numbers being to me simply wonderful. Some turnip-drills in particular exhibited their forces, being clad with them both in the furrows and up their sides; though the garden in most other parts was likewise all alive with them, their tails in their burrows while they projected the body to many and various lengths in search of food, in some instances, where the individual was of larger size than ordinary, to nearly a foot. Their food was vegetable, consisting of the flowers of the sycamore and the seeds of the elm, both of which lay thick upon the ground, the garden being bordered on its south side by trees; also pieces of potato leaves, both fresh and decaying, and portions of decaying leaves of curly greens, which I broke up and laid in their way. As soon as the tapering cephalic extremity of the worm came into contact with any portion of vegetable suited to the palate of the individual, it slowly but surely secured it; and then the worm contracted itself by degrees, drawing with it what it had thus secured, which, if not too big, was entirely withdrawn into the burrow out of sight: when too big, it stuck in the entrance, but I could not discern whether or not the worm fed upon it thus situated, as the light was now much too feeble to admit of that. Though now nearly dark, the curlews (*Numenius arquata*) were *cur-lew*-ing close at hand; and I could trace a small flock of sea-crows (black-headed gulls, *Larus ridibundus*) as they winged their way along the sinuous course of a small stream, by the occasional glancings of their white plumage. Had the earthworms brought them out to feed? I have never before observed the gulls flying at dusk.

CHARLES ROBSON.

Elswick, Newcastle-upon-Tyne.

NOTES ON THE LEMMING.

By JOHN WAGER.

DURING many summer tours in Norway and Sweden, including part of Lapland, and to a great extent pedestrian, the writer has repeatedly met with that interesting little animal, the lemming. A record of his observations, carefully noted down at the time they were made, together with information on the subject derived from persons dwelling in the vicinity of its haunts, may have some value in, at least, confirming, and perhaps on some points correcting—if not in extending—the knowledge respecting it which previous writers have communicated. Exact and circumstantial acquaintanceship with the little creature is not easily obtainable; and the intelligent Swedish pastor of a wide Lapland parish informs me that even the naturalists of Stockholm have little precise knowledge of its ordinary life. Its proper habitat, or home, so far as it has a fixed dwelling-place, is situated upon desolate and uninhabited mountain tracts; and even over those you may chance to wander for days, or possibly weeks, without a single lemming appearing in view. The nomadic Laplanders, who have the best opportunity for observing it, say there is no certain locality where it constantly and permanently resides; that (independent of its greater migrations) its habit is to wander at intervals, like their own reindeer, from one mountain tract to another; and Swedish settlers in Lapland have also informed me they may at one time meet with lemmings on any given mountain and at another time find none.

My own experience tends to corroborate this statement. In 1861, when I first visited Norway, and spent three months there, besides a coasting voyage to Hammerfest from Trondhjem, among other mountain excursions including the Dovre-fjeld, I crossed on foot the wide high table-lands between Romsdalen and Lom; the grander region of the Jötunfjeldene, and the broad and dreary backs of the mountains which rise between Lærdalsören and Urland; and during the whole of the tour I caught sight of one lemming only, just as it was disappearing in its hole. Upon the same tract also, on the way to Lom, the excrement of some small animal, probably the lemming, appeared contiguous to numerous holes. Next year (1862) starting from Christiansand about the first of June, I travelled, chiefly on foot, from Christiansand to Molde; again traversed

Romsdalen and crossed the mountains from Holseth to Lom, without seeing anything of the lemmings, except a few skins which a tourist had brought from the Fille-fjeld, where large numbers of them had appeared. From Lom I passed up Bævredal to Bævertun; and while walking thence (about the middle of August) over the grand, but desolate region of the Sogne-fjeld to Optun, I got for the second time, the first on this tour, a momentary glance at a lemming; nor did I see one other, though I passed over another mountain range to the Justedal glaciers, till I had crossed the Sogne-fjord and landed at Lærdalsören, where a few dead bodies of lemmings, which had probably descended from the Fille-fjeld, were strewn upon the ground.

The Fille-fjeld lies to the east of Lærdalsören; but, on leaving this village, I took, as on the former tour, a south-westerly direction, rising over the southern extension of the lofty Blaa-fjeld, and descending to Urland, by the almost trackless route I had followed before, but with a long line of telegraph posts to guide me over the desolate waste. Starting rather late in the afternoon, I reached at seven my resting-place for the night, a wretched sæter hut, little more than a heap of rough stones and earth, high up on the cold, misty and dreary mountain plateau. So far the route had been as clear of lemmings as I had previously found it throughout; but next morning, about two miles beyond the hut, after wading a wide, but shallow stream, I came upon them in swarms. While quietly seated, resuming my stockings and shoes, I presently saw them in all directions; running in and out of their holes among the stones; swimming across the river; nibbling the herbage, especially a small, tender, succulent leaf, and approaching so near to my feet that I could have seized them with my hand, though they scampered off if I moved. During the remainder of my walk to Urland, I must have seen some thousands of them; and after leaving Urland for Vossevangen, by way of Flaam, through Kaardalen and Rundsdal, I continued to see them in diminished numbers till after I had passed into the latter valley. At one place, where, having missed the way, to regain it I rose over elevated crags, I saw a small flock of the little creatures in a hollow below me, running about upon extensive beds of icy snow. Between Romsdal, Vossevangen and Gravdal on the Hardanger-fjord, I quite missed the lemmings; nor did I see any again till I got to Utne on the same fjord; at which place they had made their appearance, I was told, eight days before. On leaving Utne (Sept. 2nd) in a small boat, for Odde, at the extremity of the fjord, a lemming passed the boat, swimming in a direct line, having apparently come from the opposite side, distant about a mile, and was making for the shore; but a few others we passed, were swimming about for no apparent purpose. From Odde I passed into the Thelemark, by way of Roldal and Haukelid-fjeld; chiefly on mountain tracks, the present road having been made since; and on all the route I met with lemmings more or less, though not very numerously till I had passed Roldal and had approached the flanks of the Haukelid. Within the Thelemark also, as I proceeded through Grungedal, they continued plentiful; squeaking among the bushes, running incessantly across the road, here and there swimming in the lakes, and angrily jerking their little bodies as I passed—the young ones being quite as saucy as their progenitors. By the middle of September a great number of drowned lemmings lined the margin of the Tinsjö, near Örnæs, and many more, as I saw during my passage in a row-boat down the lake, were drifting on the water; and next year I learnt, that later in the autumn the lake was quite blackened with their drowned carcases. A similar swarm, the boatmen said, had thus drowned themselves twelve years before. A week afterwards, having meantime visited Hiterdal, Kongsberg, Drammen, and Modum, I passed in a wood not far from Vigersund the bodies of a few lemmings which had been killed, serving to show that they had begun to arrive so far to the south-east; but I find a remark in my note book, that I had not for some time past met with them on my way.

In August of the following year, 1863, I took another tour of the Thelemark, landing at Arendal and passing northwards through Nisserdal to the Bandak's Vand; then circuiting round to the Totak's Vand, the Mjös Vand, the Ruikan Fos, and through Vestfjorddal to Örnæs on the Tinsjö again. On the former tour, it will be remembered, I tracked the lemmings in Thelemarken, all the way from Roldal to this point, where they had begun to appear, I was told, in the autumn of 1861. Now I found them numerously near Arendal, on the south-east coast, and continued to meet with them in decreasing numbers as far as Haugsjaasund, near the foot of the Nisser lake, where, or thereabouts, they finally disappeared, and I did not see one other lemming during the remainder of the tour; but, on arriving at Christiania, I learnt that some time before a swarm of them had advanced into the grounds of the palace, and even into the streets of the city.

Passing into Sweden, I had several tours, as in Norway chiefly on foot, through Dalecarlia, Wermland and part of Norrland, before gaining sight of a single lemming. When at Nås, in West Dalecarlia, the pastor informed me that fifteen years had elapsed since the lemmings had paid them a visit; and I learnt from a Swedish lady that she had never seen a lemming in her life, till once, during a twelve-years' residence at Slättne on the Klar river, quite in the north of Wermland, she was astonished by seeing a great swarm of them pass southwards by the house, extending down the hill as far as could be seen. They moved straight forwards, and would not turn

aside for her, so she was obliged to make way for them. Early next morning only a few dead ones were visible; and as they were not seen at Ransby, five or six miles below, it is probable the swarm had swum across the river, and entered the forest on its western side. The lady's husband once saw a swarm of them crossing the river Trysild in Norway; some of them were drowned in the attempt, but a great many got well over and continued their route eastward back to the mountains from which they had probably descended. Her maid-servant, from Dalecarlia, says they are not so rarely seen in the forests of that province, especially during wet summers; numbers of them at such times being found there lying dead, having, according to peasant belief, fallen from the mountains along with the heavy rain.

The first time I saw lemmings in Sweden was in 1872, at or near Wemdalen, in the poor but picturesque province of Herjeådal, where I was told they are usually found during summer in the valleys, and not unfrequently in numbers sufficient to do much damage to the grass and corn; but in winter, it was said, they remain on the fjelds. From Wemdalen I crossed Herjeådal in a south-westerly direction, on forest tracks, to Fjäton, the first little hamlet in Dalecarlia; and all the way I met with lemmings; seldom more than two or three together, though rather numerous here and there, but never in swarms. Thence I continued on foot my lonely way through forest, and over the broad, elevated heathery and moss-grown basement of Städjan, a mountain near 4000 feet high, to Idre, the most northerly village, or hamlet, of East Dalecarlia; finding there that the lemmings had preceded me. They had arrived in the earlier part of the summer, it being now about the middle of August; and the people said it might be five years since their last previous visit, but could not tell me where they came from; some, they said, were always to be found on the higher fjelds. In winter they burrow in the ground, and eat grass under the snow. From Idre I drove southwards to Särna; and next morning, on taking to my legs and forest tracks again, saw the last of the lemmings—a few dead ones on the forest floor—and henceforth, on this tour, I saw nothing more of them, though I continued to foot it for a week longer, on forest tracks, through a corner of Norway and Norra Finskogen, to Slättne in Wermland.

(*To be continued.*)

THE following is taken from a small "Handbook for Emigrants to Queensland, Australia," published by authority of the Agent General. "Fine tracts of rich herbage exist, as at the Herbert and Diamantina, on the western broad downs. As kangaroos consume much pasture, a recent Act offers eightpence for a kangaroo scalp. One party of hunters killed a thousand in two days." Readers please supply comment according to taste.

SCIENCE-GOSSIP.

IN last month's "Gossip" the paragraphs on the chemical investigations of Messrs. Dixon & Lowe, and of Mr. Turner, should have followed the paragraph which there follows them, the reference being in each case to the Journal of the Chemical Society.

AN astronomical matter of considerable interest has lately been attracting much attention. On August 31, Herr Hartzig announced, from Dorpat University, that a bright body had appeared in the great Andromeda nebula. There had been a condensation of the nebulous matter before, but this intensely bright point was new. An anonymous correspondent, who contributed an article on the subject to the "Times," says that this appearance disposes of the theory that this nebula may be a distant galaxy of solar systems, distinct from our own galaxy. The Andromeda nebula was perhaps the one star-cloud which might be supposed to be such a galaxy, but that a star of the eighth magnitude should have appeared in it shows that this nebula is not an exception to the rule, but belongs to our own galaxy. For if the Andromeda galaxy were a galaxy equal in size to our own, it must be at a distance of at least more than a hundred times that of the farthest star in our galaxy; and to put it briefly, a star at that distance to shine as does this star would have to be 30,000 million times larger than our sun, if its surface lustre resembled his; and even if the existence and sudden development of such a mass be admitted, it would, he says, prevent our believing that the star-cloud could be a galaxy like to the same nature as our own. The brightness of the star has been observed to diminish.

IN his presidential address to the British Association at Aberdeen, Sir Lyon Playfair reviewed the position of Science, its relation to the State, to Secondary Education, to the Universities, and to Industry. He expects to see a Minister of Education during the next Parliament, blames the middle classes for what he considers a too great attention to classics, and thinks that under a proper university system teaching and investigation are not incompatible. He attributes the progress in the arts, independently of science, to three conditions—the substitution of natural forces, as those of fire or water, for brute animal power; the economy of time or of production, as by machinery; and the methods of utilising waste products, as in manufacture of ink, dyes, &c. He considers abstract discovery in science to be the true foundation on which modern civilisation is built, and that in this view science should be studied and advanced for its own sake, and not for its applications.

PROFESSOR G. CHRYSTAL, President of the Mathematical and Physical Section, in the course

of his address, urged the contact of students with the working minds of living teachers rather than a trusting to systems of examination. These systems, he says, have been tested and found wanting in nearly every civilised country on the face of the earth. He would like to see the British Association extend its usefulness by providing for the writing of scientific treatises for the use of students, by furnishing reports on science in other countries, and programmes of instruction for the guidance of schoolmasters and private students; and, if the Royal and other Societies are necessarily too select for the purpose, by broadening its basis in some way so as to encourage the "scientific plebeian." Finally, he suggests that the leaders of science should extend their influence by coming more into personal contact with others, by lecturing from time to time in the large centres of the higher education.

Before passing to the special subject of his paper, viz. Chemical Action, Professor H. E. Armstrong, president of the Chemical Section, dealt with the teaching of science. Examinations are evidently growing in disfavour, and Professor Armstrong, like Professor Chrystal, is no friend to the system. He says that both in teaching and examining two changes should be made, by which students at the very beginning of their career should, by performing a few simple quantitative exercises in determining equivalents, &c., become familiar with the use of the balance; and secondly, the imaginary distinction between so-called inorganic and organic compounds should be altogether abandoned. In the second portion of his paper he says, "the inference which I think may fairly be drawn from Mr. Baker's observations [see this Vol. p. 113], that *pure* carbon and phosphorus are incombustible in *pure* oxygen—is indeed startling."

In the Geological Section, Professor J. W. Rudd, F.R.S., occupied himself with Scottish Geology, referring at some length to the controversies on the subject, and dealing with the geology of the Highlands, associating with it that of Scandinavia. He stated that he failed to see that any such connection between the minute structure of a rock and its geological age had yet been established, that would enable the evidence of the microscope to be a substitute for palæontological evidence where that was wanting.

A new edition of Yarrell's British Birds, in four volumes, is just completed, the first two volumes having been revised by Professor Alfred Newton, F.R.S., and the two latter by Mr. Howard Saunders, F.Z.S.

It appears that MM. Paul Gibier & Van Ermengem, who were appointed by their governments to study Dr. Ferran's method of preventive vaccination for cholera, have independently arrived at the conclusion that inoculation with his cultivated virus (*comma bacillus*) does not prevent animals operated on from taking the disease.

It looks as if railways were at length on the way towards becoming accomplished facts in China, where of all places it would appear to be most difficult to introduce novelties. Now, however, several lines are proposed. Some interesting particulars are given by Mr. John Dixon in a letter to the "Times" with respect to an experimental line that was laid down from Shanghai to Woosung for the purpose of introducing the subject in a practical form to the notice of the Chinese. The length of this line was nine and a quarter miles, and its gauge 2 feet, and it was kept open for 15 months. During the making, the people showed great interest in it, and in the 15 months for which it remained open it was largely patronised by them. It came to an end through the action of Chinese authorities, but Mr. Dixon hopes that it will have led the way to the extension of the system, and moreover, avows that his object is to promote the opening up to the world of a magnificent market for rails, &c., in the trade of which England might secure the largest share. But what would Mr. Ruskin say to all this?

Engineering science seems to have long ago exceeded the limit, wherever that may be, to which it is advisable to go in increasing the size of ships. Every now and again the question crops up as to what is to be done with the Great Eastern. The last news is that by order of Mr. Justice Chitty she is to be offered for sale by auction next month.

MICROSCOPY.

Haplographium.—Since the article on this genus of Fungi was put in type, I have found *H. bicolor* in another locality, Barnt Green Reservoir, Worcestershire, on willow sticks, and was able satisfactorily to ascertain that the spores were in chains. See p. 197.—*W. B. Grove, B.A.*

Vorticellæ with two Contractile Vacuoles.—On page 163 of this volume may be found a note on this subject. In the "American Naturalist," as far back as last March, Dr. Stokes adds that he found two contractile vacuoles in *V. vestita* and also in *V. rhabdophora*. It is necessary to have the vorticella so placed that one vacuole may not conceal the other. He remarks that the two vacuoles have hitherto been observed only in those species which are also apparently more highly organised in having some kind of cuticular investment.

Starches.—In the "Midland Naturalist" for September may be found a short paper on starch, by Mr. Edward Francis, F.C.S., which was read before

the Nottingham Naturalists' Society. This paper, which includes the classification of starches after Dr. Muter, should be useful to microscopical botanists.

COLE'S MICROSCOPICAL STUDIES.—The last-received box of this series contains mounted and labelled slides of lung, brown induration; tracheal system of silkworm; horizontal section of gill of *Anodonta cygnea;* and vertical section of sorus of scolopendrium.

"THE AMERICAN MONTHLY MICROSCOPICAL JOURNAL."—The August number of this journal contains, among others, papers on Cleaning Marine Mud, by Dr. G. H. Taylor; and on Mr. Charles Fasoldt's Detaching Nose-Piece for Rapidly Changing Objectives (illustrated); and a continuation of the translation of Professor Hans Gierke's notes on Staining Tissues in Microscopy.

PROTOPLASMIC MOVEMENT. — Mr. Charles E. Bessey states, in the "American Naturalist," that the movement of protoplasm may be easily seen in the "silky" styles of Indian corn. Care should, he says, be taken to lay them flat, the styles being somewhat ribbon-shaped, not cylindrical.

BOLTON'S PORTFOLIO OF DRAWINGS.—The August portfolio of this series contains a dozen or more drawings to accompany the living specimens which have been sent out by Mr. Thomas Bolton, of Birmingham. The drawings, printed in black and white, are very interesting, and show signs of great care. Judged, as they are, apart from their specimens, some of them especially seem to deserve great praise; and on the back of each may be found some explanatory text.

ZOOLOGY.

HELIX ASPERSA AND ASPERA. — Mr. W. C. Atkinson, pointing out a mistake on p. 188 of this vol., by which *H. aspera* is printed for *H. aspersa*, says that there is a Jamaica species, to which Férussac gave the name *H. aspera,* and observes that it may be needful to note that the difference in the spelling of these two very similar names indicates the distinction between two very different species.

RHYTINA STELLERI.—In the "Geological Magazine," Dr. H. Woodward has a paper on Fossil Sirenia in the Natural History Museum. A nearly complete skeleton of the recently extinct *Rhytina Stelleri* was acquired for the museum during the early part of the year. This animal, seen by Steller in 1741, was exterminated from Behring's Island and Copper Island, to which it was then limited, over a hundred years ago. Its bones are not found on the surface of these islands, nor at the sea level, but in old raised beaches and post-tertiary peat-mosses, and their presence is ascertained by boring into the peat with an iron rod or some such tool. The skeleton confirms Professor Brandt, who attributed to Rhytina seven cervical vertebræ, the number usual in mammalia. Steller, in 1741, observed these "sea-cows" browsing in herds on the sea-weed in the shallows along the shore. When full grown their length is said to have sometimes reached thirty-five feet, and their weight three or four tons.

"PHOLAS" (P. CRISPATA).—Whilst watching the animals in my aquarium one night, I was surprised at the movements of the pholas (*P. crispata*). I have three specimens, and as they are merely lying upon some stones at the bottom of the aquarium, the conditions are not quite natural for the borer. As soon as the rays from the lamp fell upon the water, the pholades quickly turned their siphons towards the light, even so far as to bend the siphonal tube when the light was placed at right angles to the end of the siphons. When first bringing the light into a dark room, the *P. crispata* is very sensitive to it, and brings the end of its tube in a line with the direction of the lamp; but, after some short time, it takes no further notice, unless the light be concentrated, a little to its right or left, when it slowly turns the point of the siphon to the side that the light falls upon. In looking up the pholas in a number of works, I find no mention of eyes, not even that it is sensitive to light. In a small work on the "Common Shells of the Sea Shore," by the Rev. J. G. Wood, there it is stated that "on the inside of the hinge of the pholas is seen a curved projecting piece of shell, the use of which seems to be rather obscure." This statement led me to look for the projecting piece of shell mentioned by Mr. Wood. And on opening the pholas, a very beautiful modification of the usual hinge presented itself, in the form of a pair of hooks, one on the inside of each valve. The hooks are imbedded in the animal, and enable it to bring the shell close to its body when the siphons are extended, and to force the shell asunder when they are contracted, thus allowing a greater amount of freedom to the movements of the siphons. Without the hook-like hinge, or with any other form of attachment, it would be impossible for the pholas to bring its siphons within the valves. When the siphons are withdrawn into the shell, the valves gape considerably, and are quite apart; but when the siphons are extended the valves are brought together again simply by this hook-like hinge, if so we may call it, the ordinary muscular attachment has very little power over this posterior gape. I shall be glad to hear from some of ours.—*P. H. Marrow.*

AXOLOTLS.—Would E. T. D., Crouch End, kindly tell Dr. Willett, Bristol, where he could obtain the axolotls he wrote of in the August number of SCIENCE-GOSSIP?

BOTANY.

Evolution in the Vegetable Kingdom.—This is the title of a paper by Lester F. Ward, A.M., of which the second part appears, illustrated by a couple of diagrams, in the "American Naturalist" for August. The writer says that the natural affinities are between apetalous and polypetalous plants, and not between apetalous and gamopetalous, and considers that the systematic value of the subdivision of dicotyledons into mono- and di-chlamydeous, and the latter into poly- and gamo-petalous, diminishes with the progress of research. He regards the gamopetalous division as the highest in point of structural development, and concludes by saying that "the only one of all the leading forms of [plant ?] life of which we can positively say that it still preserves an upward tendency is the gamopetalous division of the dicotyledons, which, unless arrested by human agency, seems destined to form the dominant type of vegetation for the next geologic epoch."

Protoplasmic Continuity.—The continuity from cell to cell of the protoplasm of a plant has already engaged the attention of several workers. In the "Botanical Gazette" for August is a translation of a note on the same subject, by M. L. Olivier, presented to the French Academy of Sciences, and published in the "Comptes Rendus." By photographing thin and magnified cross-sections of living tissues, and afterwards examining the negatives with a lens, the cell membranes appear perforated by canals, establishing a communication between the contents of the cells. By projecting the microscope into a dark chamber, so that no light entered his eye, but what came from the instrument, he was enabled to see clearly in more than a dozen plants the interruption of the cell-walls. The method of staining was also resorted to, and by this means if the cell-walls were coloured, colourless spaces were seen, at least in some plants; while if the protoplasm was stained, the canals traversing the walls are then traceable from their shewing the same colour. This passage of the protoplasm through narrow openings occurs in many cases; "so that in the tissues of a given plant, where, up to a recent date, we have only observed a multitude of small protoplasmic masses entirely isolated, there is, in reality, a single enormous protoplasmic mass."

The Absorption of Free Nitrogen by Plants.—It has generally been understood that plants, though surrounded by so large an amount of free nitrogen in the air, are unable to assimilate it while it is in that condition, but are dependent on nitrogenous compounds for their supplies of the element. From some experiments, however, which have been made by Prof. W. O. Atwater, and communicated to the "American Chemical Journal," it appears that growing plants can take a large proportion of their nitrogen in the former method. The plan adopted was to grow peas in purified sand, and feed them with solution of nitrates and other compounds, the amount of nitrogen supplied being known. The plants were grown in the open air, but protected from dew and rain, by being taken under cover at night and in rainy weather. Under these circumstances it was found, by comparing the amount of nitrogen in the seeds and supplied to the soil, with that found in the plants and in the soil at the end of the experiments, that in some cases as much as one-third, or even one-half of the whole nitrogen of the plants had been obtained otherwise than from the soil, that is, it is presumed, in the form of free atmospheric nitrogen. In the other cases, with one striking exception, there was also a gain, though to a less extent, of nitrogen over and above that obtained from the soil. The possibility of the acquisition being from ammonia in the air instead of free nitrogen is noted, but rejected on account of the large amount gained. An abstract of the paper may be found in the "Journal of the Chemical Society" for September, from which this note is taken, and where further details are given.

GEOLOGY, &c.

Human Bones.—In some excavations made in January of last year, near the city of Mexico, several human bones were unearthed, an account of which may be seen in the "American Naturalist" for August. The bones exposed comprised part of the cranium, lower and upper maxillæ and fragments of collar-bone, vertebræ, ribs and bones from upper and lower limbs. The canine teeth have the peculiarity of being of the same shape as the incisors. No other animal remains were found in a sufficiently satisfactory condition to fix the age of the rock, nor any vestige of ceramic or other modern remains. From considerations pointed out in the paper, however, the writer, Mariano de la Barcena, concludes that the formation in which the bones lay belonged perhaps to the upper Quaternary, or at least to the base of the present geological age. He considers that they belonged to a prehistoric man of ordinary stature and about forty years old.

Underground Heat.—In a very interesting and suggestive paper in the "Geological Magazine" for September, Mr. J. Starkie Gardner, F.G.S., discusses the question whether the heat which exists below the surface of the earth is likely to be at any time made available for use on the surface. The interior condition of the earth, he says, is still a debated subject; many geologists believing that it is partially fluid, the fluid which is beneath the solid crust resting also upon a solid interior. If the only reason for the observed prevalence of earthquakes

in winter over that in summer be the diminished pressure of the air, which allows a corresponding expansion of fluid in the interior, how thin, as the author remarks, must be the crust of the earth! He thinks that the temperature of boiling water may perhaps be met with at a less depth than that indicated by the rate of increased temperature in artesian wells, viz, 10,000 feet, but says that modern engineering might possibly be equal to piercing even this depth. His suggestion of sinking a shaft into molten lava is certainly bold, but if things go on as now, the time will come sooner or later, when, as Mr. Gardner says, we shall be driven to try to discover modes of obtaining heat without the combustion of fuel.

NOTES AND QUERIES.

NASTURTIUM.—In reply to L. Lee, permit me to give my view of the laciniated margins (not hairs) at the junction of the blade with the claw of the petals of the so-called nasturtium. For brevity, I will call them bristles, especially as there is a certain rigidity about them. If memory serves me rightly, Kerner mentions them as a contrivance to keep out "unwelcome guests," but does not state in what manner this is brought about, and I fail to see how they can keep out any insects, big or little. The arrangement in the flower of canary-creeper is much the same as in nasturtium, and my remarks to one will apply to the other. Briefly, my view is that these bristles serve the purpose of guiding the visiting insect so as to ensure its coming in contact with the proper organs. This is brought about in the following way:—1. The bristles stand out at a sharp angle to the lamina of the petal. 2. The trifid stigma projects to nearly the same height as the bristles, and midway in the plane between the bristles and the entrance to the spur. 3. The anthers, before dehiscing, lie back between the claws of the three anterior petals and upon the two anterior sepals in nasturtium, but between them in canariensis. In this stage the filaments are bent outwardly at an angle of 45° at least. The anthers advance successively to dehisce in the plane between the bristles and stigmas. 4. The flower is half pendulous. 5. Given an insect of proper size and weight, it will, in making for the spur and guided by the purple blotches and streaks, either clamber over or alight or stand upon the projecting bristles. In any case, the under-surface of the insect will unerringly come in contact with the anthers and stigmas. Bees and wasps are too heavy to do this work properly, and I suppose that these flowers in their native countries have insects especially adapted for their fertilisation. Note length of spur, &c. I do not think the same insect that fertilises the canary-creeper would do for nasturtium. The flowers appear to be proterandrous, but of this I cannot be sure; if, however, they are, the arrangement for cross-fertilisation is complete. The flowers are wonderfully free from small insects, such as would rifle the nectary without bestowing a corresponding benefit upon the flower; but what keeps them away I don't know. The plant generally is free from insects, and the leaves retain their intactness to a remarkable degree. In both species of tropæolum the leaves and stem are glabrous, and I am inclined to think that their principal protection is their pungent taste and smell.—*J. Hamson, Bedford.*

PIED FLY-CATCHER; WOODCOCK; WOOD-WARBLER.—Notes in the last two or three numbers of SCIENCE-GOSSIP show that the pied fly-catcher is extending its range. It has not been recorded from the south-west of Scotland, but last year a pair made their appearance, about May 13, in a glen containing a considerable number of old alder-trees, which form a favourite nesting-ground for tits, redstarts, and spotted fly-catchers. On May 31 the pied fly-catchers' nest, which was placed in rather a deep hole in one of the alders, and composed entirely of grass—coarse grass outside, and very fine grass inside—contained six eggs, rather paler than the redstarts. One egg was taken for a specimen, four were hatched, and one was left in the nest, which contained a half-formed bird. This year the fly-catchers occupied the same nest, and laid only three eggs; but none of their young seem to have returned to the district of their nativity. Two other birds seem to be extending their breed-range—the woodcock and wood-warbler. The woodcock breeds plentifully in the highlands of Scotland—at least, in some parts of them; but it is more frequently met with during the breeding season in Dumfriesshire now than it was a few years ago. The wood-warbler has increased immensely during recent years. Ornithologists of Macgillivray's time seem to have considered it rare in Scotland, whereas now it is almost as plentiful as the willow wren, and is to be heard in every bit of wood in the district. On landing from a steamer at Balmacarra, about four A.M. on a June morning in 1883, it was the first bird I heard, and it was almost constantly heard along the wooded banks of the Caledonian Canal, from Inverness southward.—*Scot.*

THE COMMON SUNFLOWER.—That the bracts are modified leaves is not a matter of doubt. It is not so clear that the ray-floret is derived from a bract. Most botanists believe the series of bracts to be continued in the scales which may be found at the base of all the florets, and surrounding each blossom in such a way that Mr. E. A. Swan calls it a rudimentary calyx. As described in most works of elementary botany, every floret of the sunflower, or other plant of the same natural order, is a flower with organs corresponding to similar organs in other flowers, which appear in the axils of leaves, as in the fuchsia, or of bracts, as in mignonette. Perhaps the analogy may be best made out in the head of a teasel, in which the bracts at the base of the flowers bear more resemblance to those of the sunflower, but are larger. In the teasel, too, the parts of the flower are more easily distinguishable. The real calyx of the sunflower appears in what E. A. Swan calls a short pointed wing from either side of the achene. These wings are analogous to the sepals forming the calyx of a proper flower, and, in the language of botanists, are sepals as much as those which cover the unopened blossom of a poppy; the corolla consists of five coherent petals, which, in a ray-floret, are expanded into a flat limb, instead of being tubular. The stamens are held by modern botanists to be modified leaves, of which the leaf-stalk is represented by the filament, and the blade by the anther.—*John Gibbs.*

NESTS WITHIN NESTS.—During a recent visit to Ashdown Forest, while looking for young squirrels, I found no less than four old dreys which were tenanted by the common, yellow-banded humble-bee (*Bombus terrestris*); and in one case the bees had not been the first to take possession of the deserted

drey, for on pulling open the tangled mass, in spite of the buzzing remonstrances of its occupants, I discovered a small bird's nest of moss, with a lining of feathers (most probably that of *Certhia familiaris*, the tree-creeper), in which, having descended the tree, I found the queer, bag-like cells of the humble-bees. The tops of fir-trees being a rather unusual field for the researches of naturalists, and also a place where one would hardly expect to find the nests of bees, which, as a rule, build in the ground, this fact may not have been before noticed, and therefore it may perhaps be interesting to the readers of SCIENCE-GOSSIP.—*Wilfred Mark Webb.*

PAPER-EATING MOLLUSCS.—I was interested in Mr. T. D. A. Cockerell's account of the unusual diet of *Limnæa stagnalis*, and have no doubt scarcity of food was the cause. Whilst a friend and I were collecting in a large sheet of water near Prestwich, about a week ago, I chanced to lift out a large piece of brown paper, which had become quite pulpy through long lying in the water, and was surprised to find it studded with numerous fine specimens of *Sphærium corneum.* We picked off over forty shells. and also a number of *Planorbis carinatus* and *Bythinia tentaculata.* The place swarms with *L. stagnalis* and *L. peregra*, and many were close to the paper, but none on it, so it would appear that they had not been driven to the paper-eating extremity of Mr. Cockerell's specimens. The bottom of the lake is clothed with a dense growth of *Anacharis alsinastrum*, and the paper was lying upon this, about three inches below the surface of the water. I did not think much of the Bythinias or Planorbi being in such a situation, but certainly was surprised to find the bivalves "at home" there. Each bivalve had nibbled an oval hole in the paper, and apparently had been there for some time, as the shells were beautifully clean, and all seemed thriving upon their strange diet. My friend and I had for over two hours been expressly "scooping" for bivalves with but meagre results, having taken less than a dozen specimens, so the paper furnished us with a good haul.—*R. Standen, Swinton, Manchester.*

"DRUID STONES" AT STANTON DREW.—In reply to Mr. Bird's query respecting these, I beg to furnish him with what information I possess on the question. On the south side of Stanton Drew Church, in an adjoining orchard, are to be seen three Druidic stones, of which two are erect and the other prostrate, the latter being about fourteen feet long by eight feet wide. A short distance from these are the remains of a circle of stones, of about one hundred and twenty feet in diameter; however, of these but six now remain, and are nearly all prostrate, and more or less covered by the soil. In an adjoining field, about one hundred and fifty yards distant, is the circumference of the largest of these circles, which has a diameter of three hundred feet; the largest stone is about eleven feet long. The last circle has its diameter stated at ninety-six feet, with the principal stone some fifteen and a half feet long and five feet square. Lying near this circle are seven stones, which, though now scattered, lead to the supposition that they formed part of an avenue. Stanton Drew is believed to have had an earlier construction than either of those two grand Druidical monuments—Stonehenge or Abury. A reference to No. 95 of the "Archæological Journal," and to Mr. W. Long's paper, will no doubt furnish particulars of a very interesting character.—*Alfred W. Griffin, Bath.*

FLINT IN BATH-STONE.—A rather unusual occurrence took place while St. Philip's Church was being built at Arundel. One of the hewers was sawing a large block of bath-stone, when his saw came in contact with a flint stone about the size of a large walnut. I think that this is worthy of being published, as I have never heard of it before.—*Archibald W. Fry, Arundel.*

LYCŒNA ICARUS.—With reference to Mr. Coste's note on p. 214, I may mention that a few days ago I found a specimen of *L. icarus* (or, as he calls it, *P. alexis*) at rest on a *Juncus* stem in a very swampy place on Chislehurst Common. I was rather struck by the fact, as this species had always seemed more fond of dry fields. Many species revisit a locality after being frightened away. I have noticed it in *Chrysis cyanea* at Bedford Park.—*T. D. A. Cockerell.*

BRITISH DRAGON-FLIES.—With reference to a note in a former vol. of SCIENCE-GOSSIP on dragon-flies, M. Skelton, M.C.S., writes to say that he has obtained a book on the subject, and gives the title as follows: "British Libellulinæ or Dragon-flies illustrated in a series of lithographic drawings, with a brief description of the insects, times of appearances &c. By W. F. Evans, M.C.S. Printed for private circulation, 1845."

SWARMS OF FLIES.—In reply to query in September number of SCIENCE-GOSSIP: I was on the Lincolnshire coast early in August, and observed two or three times, on the rising of the tide, a line of green flies which had been cast up by the waves. Once I followed the line, a sinuous one, for over three miles. The flies had, of course, been blown out to sea, and then been cast up again. The line was thick enough to be observable at a distance of twenty yards.—*W. Mawer.*

SWARMS OF FLIES.—A swarm of green flies (Aphis) occurred in West Cowes, Isle of Wight, during the second and third weeks of July. In the streets the air seemed full of them. They disappeared towards the end of the month.—*R. H. Nisbett Browne.*

SILKWORMS.—Some time last month a little girl, interested in watching the development and various changes of the silkworm, informed me that a young friend of hers, in winding off a cocoon, was surprised to find it contained two pupæ. At the time I thought there must have been some mistake; but Mr. Epps' experience seems to fully bear out this statement. I understood my informant to say they were able to wind off the silk from the cocoon in this particular instance; consequently, I should judge that only one worm did the spinning, the other remaining dormant meanwhile.—*A. Jenkins, New Cross.*

SILKWORMS.—Respecting Laurence G. F. Epps' query about double cocoons, I beg to say it is quite a common occurrence. In Tuscany, where I pass a great part of the year, and where silkworm-rearing forms a portion of the ordinary business of the farm, double cocoons are generally set apart when bringing the cocoons to market, and sell at a lower price than the ordinary ones. As I have not tried to unwind the silk thread from any double cocoons, I cannot tell if it is generally broken or not. But I know that, for some reason or other, they are not liked by silk merchants. —*L. de Virte.*

FRESH-WATER SHELLS.—In the spring of last year bivalves, popularly known as "fresh-water cockles," belonging to the group Cycladæ, and to the species *Cyclas lacustris* (?), were plentiful in ponds in the

neighbourhood of Louth. One of these cockles, I observed, had attached itself to the foot of a newt, and another was enclosing the toe of a frog. Is this a common occurrence?—*R. W. Goulding.*

SEEDS OF SOLANUM DULCAMARA.—I should be glad to know whether the seeds of *Solanum dulcamara* are poisonous to birds. During some severe weather in the winter of 1883–4, I saw some bullfinches greedily eating them; the birds seemed to avoid the fruit, for the snow under the hedge was strewn with the pulp of the red berries.—*D. M. H.*

PAULOWNIA IMPERIALIS.—I have a large tree in my garden here, more than twenty feet high, which I have never known to do otherwise than flower each spring for certainly the past six years; I have not heard of its failing to do so previously. As a tree, the Paulownia is by no means handsome, and the flowers are lost sight of so high up, but I have been told that, as a shrub, it is well worth cultivating. I should be very glad therefore if any of your readers could tell me the best means of propagating it. My gardener has tried cuttings, but without success. There used to be an old tradition here that at one time there were only three Paulownias in England, one being my own, another being, curiously enough, in a garden in the undercliff of the Isle of Wight, belonging to a brother of mine; the third, I think, somewhere in Hampshire, but where I never heard. Can your correspondent D. Owen have stumbled on this third specimen?—*A. Lloyd, The Dome, Bognor.*

[The note on Paulownia, on p. 166, was written from Clifton.]

MIMULUS LUTEUS.—In a ramble in North Devon at the end of July I met with the yellow monkey-flower completely naturalised, and in great abundance for more than three miles along the banks of the Tam, near North Sawton. It was then in full bloom. A lady informed me that in 1876 there was none of this plant by the river, but that a few years afterwards it began to spread from a garden to the stream. As it is now thoroughly established, it nay be well to fix the date of this. Since Watson in the "Topographical Botany" does not allude to the distribution of this pretty plant, and Syme speaks of it as occurring chiefly in Scotland, it would be interesting to obtain instances of its naturalisation elsewhere in England.—*F. H. Arnold, LL.B.*

ACHATINA ACICULA.—This shell, which is generally considered somewhat rare, has lately been found by Mr. Joseph Wilcock in gardens in Wakefield. In April and May he found considerable numbers in a neglected garden among the fibrous roots of weeds, at a depth of from 6 to 10 inches. In July, whilst digging up tulip bulbs in a garden in another part of the town, Mr. Wilcock found some hundreds, about one-third of them in different stages of growth, being alive. The living ones were discovered beneath the outer envelopes of the bulb, and also in small pits or cavities, which seemed to have been eaten into the bulb by the mollusk. *A. acicula* is generally found on the limestone, but Wakefield is on the Carboniferous Sandstone; and what is singular, the gardens are within the town close to the streets. —*Geo. Roberts, Lofthouse.*

WHITE FLOWERS.—*Ajuga reptans.* White varieties of this plant are sometimes found in this district, but they are not at all common. I have noticed albino varieties of the following plants this season; *Lychnis Flos-cuculi, Epilobium angustifolium, Malva moschata, Fritillaria Meleagris* and *Narcissus Pseudo-narcissus;* in the latter the corona alone was white, the perianth-segments being lighter than the type.—*John W. Odell; Pinner.*

RANA ESCULENTA.—When I was a boy, some forty years ago, we used to find the Edible Frog rather plentifully in Foulmire (or Foulmere) Fen, Cambridgeshire. I believe that Fen has been drained and cultivated, so that probably all the *Rana esculenta* have disappeared from the locality now.—*Thomas Scott.*

MISTLETOE.—To Mr. Webster's list of 28 "hosts" for the mistletoe, I can add one more. On April 6th, 1883, in Palestine, in the Vale of Nabulus or Shechem, the "fat valley," I found a mistletoe growing abundantly on *olive-trees.* It is not dichotomous; so I suppose the species is not *album.* You can publish this fact if you deem it worth while.—*B. B. Le Tall.*

FREEZING MACHINE.—I have searched in vain for an account of Carré's *Continuous* Freezing Machine, and should be glad to have it explained, or to hear where it is described. I am also desirous of learning the amount of water-vapour absorbed by sulphuric acid at any pressure and temperature; also the quantity of ammonia absorbed by ice, and whether a solution of ammonia freezes at a lower temperature than water.—*J. P.*

LIMNÆA STAGNALIS, *var.* "ELEGANTULA."—Mr. Taylor said that this form resembled var. *bottnica*, not *botanica* as misprinted in the footnote on page 179. I know of no var. "*botanica.*" My brothers have taken three more scalariform specimens in the pond where this variety is found, so that altogether five have been found in this little pond, which has unfortunately been dried up by the recent hot weather. —*T. D. A. Cockerell.*

ZONITIS DRAPARNALDI.—Last July I found some Zonites at Torcross, S. Devon, which Mr. J. W. Taylor has identified as this species. This is the second or third locality in South Devon for which it has been recorded, and it is evidently more widely distributed than has been supposed. Other things found at the same place were *Z. alliarius, H. aspersa, H. nemoralis*, 00300, 12345, 00345, 023(45), *H. rufescens, H. hispida, H. revelata* (one specimen in an old slate quarry facing the sea), *H. virgata, H. caperata, H. rotundata* and var. *alba, H. pulchella, B. obscurus, P. umbilicata, Balea perversa* (common in one place under an old wall), *Clausilia rugosa* and *Coch. lubrica.* —*F. G. Fenn, Bedford Park, W.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

J. Sinel and W. C. A.—Thanks for yours.

R. M.—An anonymous exchange.

J. Taylor.—"Journal of Conchology." London: D. Bogue. Probably quarterly.

J. Braby.—Sends a few tiny larvæ and wants them named. No information supplied as to what they feed on, or where found, &c. &c.!

J. A. Wheldon.—No. 1 looks like a spurrey, but it is not easy to name it satisfactorily in its present condition.

A. Somerville.—Write to H. Wallis Kew, Hon. Sec., Louth, Lincolnshire.

B. H. and W. A. H.—Yours not exchanges.

L. F.—These are not exchanges, nor otherwise suitable.

W. H. Boland.—Your exchange is not inserted, for reason which may be gathered from note on page 212.

R. Paulson.—An answer perhaps next month.

EXCHANGES.

L.C., 7th Edition: Duplicates, 40, 41, 1626, 315, 408, 455, 468 g. e. u., 539, 558, 561, 615, 628, 668, 801, 931, 1036, 1040, 1043, 1072, 1090, 1125, 1319, 1384, 1421, 1438, 1570 b., 1586, 1589, 1591, 1597. Desiderata numerous. Lists exchanged.—J. A. Wheldon, Burgess Hill, Sussex.

British land and fresh-water shells in exchange for British marine or foreign shells. Wanted, *Vertigo Lilljeborgi* (Westerlung), *V. tumida*, *V. alpestris*, and *V. minutissima*. Offered very large examples of *Unio pictorum* and others.—W. Gain, Tuxford, Newark.

Helix pomatia, *lapicida*, *ericetorum*, *virgata*, *arbustorum*, *Cantiana*, *Cochlicopa tridens*, *Clausilia laminata*, *Clausilia Rolphii*, *Bulimus obscurus*, *Zua lubrica*, *Pupa umbilicata*. Desiderata: imagoes, pupa, larva British Lepidoptera, or offers.—A. Beales, 37 Kingsley Road, Maidstone.

Duplicates: *Pisidium fontinale*, *P. roseum*, *P. pusillum*, *Bythinia Leachii*, *Zonites glaber*, *Z. nitidus*, *L. lævis*, *B. perversa*, &c. Wanted *Pisidium nitidum*, *Cl. Rolphii*, *Vertigos*, and many others.—F. Fenn, 20 Woodstock Road, Bedford Park, Chiswick, W.

Wanted, Newman's "Entomologist," Nos. 102, 190, 193, 194, 196, 197, 220, 221, 222, 223, and "Entomologists' Monthly Magazine," Nos. from 49 to 55, inclusive of vol. v., also "Archæologia Cantiana," vol. i.—F. F., 1 Park Place, Eltham, Kent.

Science-Gossip for 1879, and 1880, in numbers, for British birds'-eggs side-blown, one hole butterflies or moths or pupæ.—F. J. Rasell, 9 Raglan Street, Peas Hill Road, Nottingham.

Double bent nosepiece, stand condenser, microtome with razor and hone, for vol. i. of Bornet's "Notes Algologiques."—T. H. Baffham, Connaught Road, Walthamstow.

British marine shells, wanted in exchange for *Turritella terebra* and its variety *gracilis* (both very fine), *Venus gallina* and the variety *alba*, *Scalaria Turtonis*, and many others. Send for list.—G. O. Howell, 3 Ripon Villas, Ripon Road, Plumstead, S.E.

Micro-slides for exchange. Skin of dog-fish (polariscope). Hairs of mole for two good mounts.—J. B. Bessell, Sidney Villa, Fremantle Square, Brtstol.

S. bembeciformis, *H. velleda*, *B. quercus*, *N. fulva*, *C. graminis*, *H. Haworthii*, *X. silago*, *P. chi*, *M. typica* and many others, for other Lepidoptera.—E. Eggleton, 12 Tillie Street, Glasgow.

"Knowledge" for 1883–4, just bound, in exchange for other books. Mudie's "British Birds" with coloured plates wanted.—H. F. Medley, Palmerson Square, Romsey, Hampshire.

Well-blown eggs of osprey, yellow-billed cuckoo, golden-winged woodpecker, Virginian quail, Bartram's sandpiper, spotted sandpiper, belted king-fisher, and Leach's petrel, offered for others not in collection.—J. T. T. Reed, Ryhope, co. Durham.

Volvox globator, mounted so as to show cilia with black ground illumination, in exchange for other good mounts.—H. B. Linthorn, 130 Hampton Road, Clifton, Bristol.

Offers requested for two dozen histological specimens well mounted.—H. Price, 14 Munton Road, New Kent Road, London, S.E.

Send stamped and addressed envelope or box for specimens of *Clausilia parvula* from Rouen.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

Wanted, Silurian and Devonian Fossils, in exchange for Ferns, Calamites, &c., from Lancashire coal measures.—C. F. Cross, Werneth Hall Road, Oldham.

Wanted, to exchange 18th and 19th century copper tokens.—J. Macmillan, 53 Gough Road, Edgbaston, Birmingham.

An injecting syringe, nickel-plated, in case with stop-cock and two canulas, never been used, in exchange for micro-slides, books, apparatus, &c. Also a self-centering turn-table (Dr. Mathews) for exchange.—H. J. Parry, 10 Windsor Terrace, Newcastle-on-Tyne.

Duplicate microscopic-slides of various sorts, and Lepidoptera to exchange for other slides—algæ, and fossil woods or other rocks.—A. Wells, Dalmain Road, Forest Hill.

Wanted, good Eocene fossils for American or foreign shells.—Geo. E. East, jun., 10 Basinghall Street, London, E.C.

A few fossils from the Drift for exchange for other good fossils.—A. T. Evans, 171 Cooksey Road, Small Heath.

What offers for "Knowledge," Nos. 30 to 199 (5 volumes and a part, clean, unbound)?—W. Crompton, 89 Market Street, Chorley, Lanc.

Will exchange fine healthy cocoons of Pernyi for Cecropia, Polyphemus, Luna, Promethea, Yama-Mai.—William Thomson, 62 Croft Street, Galashiels.

Wanted any of the following Carices: 1415, 1416, 1417, 1418, 1435, 1436, 1438, 1440, 1441, 1446, 1447, 1456, 1458. Can exchange South of England plants.—Robert Paulson, 10 Ferron Road, Clapton, E.

Electrical Machine cylinder 8 × 5½ inches, brass conductor 8 inches, on good mahogany stand; will take good natural history; also several unused zincs and carbons for batteries, and other electrical apparatus.—F. Betts, 63 The Chase, Clapham Common.

Wanted Larvæ or Pupæ of *S. Cecropia*, *T. polyphemus*, *promethea*, *A. Luna*, *S. pavonia-major*, &c. Offered British Lepidoptera or choice flower seeds.—R. Laddiman, Hellesdon road, Norwich.

Wanted European or Foreign beetles for South African beetles. Lists exchanged.—R. Lightfoot, St. Paul's, Capetown.

Wanted sets with data, with or without nests, of the following British laid eggs. Eagle, osprey, hobby, kite, buzzard, Hamer, short-eared owl, red flycatcher, stonechat, marsh and Dartford warblers, owl bunting, hawfinch, chough, ptarmigan, dotterel, ducks, divers, grebes, terns, petrels.—Wm. Mark Pybus, 38 Bewick Road, Gateshead-on-Tyne.

Wanted nests with clutches of eggs of following species: spotted flycatcher, pied flycatcher, nightingale, stonechat, marsh warbler, Dartford warbler, wood warbler, creeper, rock pipit, wood lark, cirl bunting, brambling, hawfinch, goldfinch. A good exchange given for above.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

Will exchange a collection of 180 eggs, including mute swan, puffins, cormorants, guillemots, mallard, curlews, snipe, hooded crow, kestrel, sparrowhawk, cuckoos, ptarmigans, spoonbills, bee eaters, woodchats, swifts, and many others, for a good banjo.—W. Denison, Courier Office, Halifax, Yorks.

Lond: Cat: 7th ed. wanted: 90, 153, 347, 580, 665, 780, 784, 792, 793, 820, 828, 845, 934, 1029, 1299, 1415, 1451, 1545, 1552, 1610, 1622, 1659, 1669, 1674; for 2, 49, 81, 183, 270, 360, 415, 416, 446, 451, 587, 626, 628, 841, 842, 946, 1034, 1125, 1128, 1209, 1287, 1376, 1433. *Agrostis nigra*; *Malva borealis*; *Potentilla norvegica*; *Sparganium neglectum*; *Chara longibracteata*; *Cucubulus bacciferus*; *Xanthinna strumarium*.—P. F. Lee, West Park Villas, Dewsbury.

Living specimens of the rare hydroid *Cordylophora lacustris*, loaded with infusoria, and rotifers, sent in exchange for samples of mud and water from ponds, or slow-flowing rivers; not less than four-ounce bottles.—Medicus, 363 Old Kent Road, S.E.

BOOKS, ETC., RECEIVED.

"Elementary Star Atlas," Rev. T. H. Espin, F.R.A.S. (London Sonnenschein & Co.)—"Grape Rot,"—"Journal of the New York Microscopical Society,"—"Journal of the Royal Microscopical Society,"—"The American Naturalist."—"Ben Brierley's Journal."—"Science."—"Procedings of the Bristol Naturalists' Society."—"The American Monthly Microscopical Journal."—"The Botanical Gazette."—"The American Naturalist."—"Feuille des Jeunes Naturalistes."—"Fifteenth Annual Report of the Entomological Society of Ontario."—"The Midland Naturalist."—"The Naturalist."—"Gossip."—"Penzance Nat. Hist. and Antiquarian Soc. Reports and Transactions, 1884–5."—"Proceedings of the Academy of Natural Sciences of Philadelphia."

Communications received up to 11th ult. from:—E. de C.—J. C.—J. T. R.—P. H. M.—T. B.—W. T.—W. K. M.—W. C. A.—D. M. C.—J. B.—R. M.—D. S.—C. B. M.—B. P.—C. E. M.—C. C.—M. S.—T. D. A. C.—W. M.—W. C.—A. J.—J. H.—R. H. N. B.—A. B.—F. F.—A. T. E.—G. E. E.—B. W.—C. P.—W. B. G.—H. J. P.—C. F. C.—F. F.—W. G.—W. E. D.—F. J. R.—A. C.—T. H. B.—J. M.—J. G.—G. O. H.—G. R.—J. B. B.—R. L.—R. S.—E. E.—A. W. F.—F. G. F.—A. W. G.—H. F. M.—L. de V.—B. H. B.—H. L. D.—A. P. W.—H. P.—S. C. C.—J. T. T. R.—G. S.—L. F.—H. B. L.—W. M. W.—E. A. D.—E. H. R.—R. P.—W. M. P.—P. F. L.—J. M.—W. K. M.—B.—F. B. B.—W.—B. L.—&c. &c.

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POLYSIPHONIA FASTIGIATA.

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GRAPHIC MICROSCOPY.

BY E. T. DRAPER.

No. XXIII.—POLYSIPHONIA FASTIGIATA.

ON most of the larger littoral algæ, but rarely beyond low-water mark, may be found the delicate and elegant parasitical *Polysiphonia fastigiata*; it grows abundantly on the fronds of *Fucus nodosus*, and often entirely covers the long thong-like stems of *Fucus vesiculosus*. Although common, and apparently uninviting as an object of beauty, the microscope reveals its extreme elegance. It is discovered forming dense globular tufts two or three inches long, about the thickness of a horse hair at the base, expanding in parallel branches pointing upwards, somewhat rigid. Microscopically, the frond is found to be filiform, and articulated, repeatedly forked, marked externally with striæ, interrupted at the joints, and generally the structure is disposed in a series round a central cylindrical internal cavity; the colour brown-pink—purple-black when dry. Although the mode of propagation has until recently been somewhat obscure, it is ascertained that there are two kinds of fructification, in distinct plants. Tetraspores which at maturity divide into parts, generally four, or more; and antheridia, oblong bodies, rounded at the extremities, produced in fascicles on the summits of the ramuli, and subdivided into parts. The drawing shows the apices of a frond with these reproductive organs. They are so extremely abundant in the early spring months, as to give a very conspicuous yellow colour to the tufts on which they are produced.

Minute marine algæ, for microscopical observation and preparation may be cultivated, or rather kept in a growing condition for a few weeks in small vases of sea-water, in a cool and shady position, under an equable temperature. It is of importance that the plants should be attached to a portion of the substance on which they are found growing; for permanent preservation, the lace-like fragment should be floated on fresh water, lifted carefully on the usual glass slip, well drained and immersed in glycerine jelly under a thin cover; no pressure should be used. Dry specimens are mounted, but they rarely exhibit the integrity or delicate features of the fructification.

Crouch End.

ON MIMICRY IN DIPTERA.

WHEN will some of our entomologists who have collected and studied nearly every Lepidopterous insect known to inhabit Great Britain, devote even a small amount of attention to the other orders of insects? The Coleoptera certainly have received a fair amount of attention, but the Diptera have been sadly neglected.

And this unpopularity is scarcely deserved by them, for albeit they do not possess the brilliant colouring and large dimensions of some butterflies, many of them are extremely elegant; while their points of interest will be found to be almost more varied and more striking than those of the Lepidoptera.

Any who would take the trouble to catch and pin out the Diptera found in their neighbourhood might possibly discover new habitats, if not new species; in any case, such a collection would greatly assist our knowledge of the distribution of the various species.

Those who travel miles to find a rare moth are usually only going over old ground that has been visited by scores of collectors bent on the same errand, and instead of increasing our knowledge of the insects, are only lending their small aid to the extermination of the species.

The subject of this paper, is, however, one which opens up a wide field for observation, and in which much valuable information might be obtained even by those who have not sufficient leisure to form a local collection.

Many of the species mentioned below are among our commonest insects, while other not rare flies may prove on observation to be cases of mimicry.

One of the first things that a beginner at "fly catching" would notice is the extraordinary similarity between some of these insects and the bees and wasps. In showing my Diptera to friends, I notice that they constantly remark, "That is a bee, surely?" or "That is a wasp?" And the editors of "Little Folks" fell into the same error some years since, for I have before me a volume in which, among other instructive paragraphs for the young, I find one on "Busy Bees," accompanied by a very fair woodcut of several flies including Stratiomys, Tabanus, and even Tipula, but without a single bee or wasp among them.

That the Romans and other ancients evidently made a very similar mistake, owing to this resemblance, we shall see presently.

Beginning with the Stratiomyidæ, we find among the species of Stratiomys a considerable similarity to bees, especially when flying.

My specimen of *S. furcata* was captured under the impression that it was probably a bee, especially as the insect, when settling on a plant, folded its wings over the back in the same manner as do the bees.

Asilus crabroniformis (SCIENCE-GOSSIP, 1876, p. 156, Fig. 85) is so called from its having rather the habit of a hornet when on the wing, but when captured, it is seen to be so entirely unlike a hornet that, without further evidence on the subject, I can scarcely believe it to be a case of mimicry. Much more is *Laphria ephippium*, another insect of this family, like a bee. This fly occurs in many places on the Continent.

In the Leptidæ, I observed a remarkable case of undoubted mimicry, the mimicked insect being in this case, not a Hymenopteron, but a Neuropteron. I was walking along a lane in Warwickshire one June, some two or three years back; the scorpion fly (*Panorpa communis*), a neuropterous insect, familiar to all who live in the country, was extremely abundant, the hedges swarming with them, and after netting one or two of these, I thought I had captured another, but on examining it, I found it had two wings instead of four, and was easily recognised as *Leptis scolopacea*. I have placed the two insects in my collection side by side, and even when compared closely they possess considerable similarity with the wings folded.

In both, the wings are mottled with brown spots, the legs are longish and rather thin, and the abdomen is also slender.

But when settling on a hawthorn bush, the insects were only with difficulty to be distinguished from one another, so that it is beyond doubt that, the scorpion fly, of which the body is rather hard, not being a very palatable meal for birds, the Leptis takes advantage of its similarity with this insect to escape being eaten, it being a softer bodied insect and therefore better food for birds. The fact that the Panorpa was by far the more abundant insect of the two is in corroboration of this.

The species of Bombylius, although called humble-bee flies by some entomologists, do not much resemble any of our British species of Bombus. They feed on the juice of flowers, as does the humming-bird moth.

Though rather like some Apidæ, my observations would lead me to give my opinion against their being cases of mimicry, but perhaps that may be because I have not found the mimicked insect. As they dart about quickly, they may not need protection.

But it is among the flies of the family Syrphidæ that we find the most singular resemblance with Hymenoptera. Who has not seen the ubiquitous drone fly (*Eristalis tenax*) buzzing on the window pane, or, in late autumn, crawling wearily along the sill, and who has not mistaken it for a bee (*Apis mellifica*)? I have but to go into the garden and watch a patch of flowers; there, beside the numerous bees which come to gather honey, I am sure to find some of these flies. And I have to look twice before pronouncing them to be flies. If I take one of them in my fingers, some non-entomological friend will certainly exclaim, "Take care it does not sting you!"

Baron C. R. Osten Sacken has pointed out that the belief, universal among the ancients, that bees originated from carcases of dead animals (oxen, &c.), undoubtedly owes its origin to this resemblance. That belief is often mentioned in their writings (for instance it is alluded to at great length in Virgil's "Georgics," book iv. verses 285 *et seq.*), and has been reproduced by the earlier modern writers, such as Aldrovandi ("De Anim. Insectis," p. 58, edit. 1602), and Moufet (Theatr. Insect., p. 12).

The rat-tailed larvæ of Eristalis thrive in putrefying animal matter, and the very natural explanation of the superstition is that the perfect insects were mistaken for bees.

Eristalis æneus, as well as *Cheilosia chrysocomus* closely resemble some of the Andrenidæ, both in colouring and in general appearance.

E. floreus, on the other hand, takes after the wasps in its colouring; some specimens of this fly would be mistaken for wasps by any but an entomologist.

In that respect it is not singular, for several Syrphidæ are somewhat wasp-like when flying, but perhaps the best imitation of a wasp is that afforded by *Chrysotoxum arcuatum* and *C. octomaculatum*. The latter species is rare in England, but at Heidelberg some few summers past, when wasps (*Vespa vulgaris*)

were very troublesome, there was rather an abundance of *C. octomaculatum.* The yellow and black markings on the abdomen, the wings with a brownish tinge, especially along the anterior margin, and even the long antennæ, all combine to produce an appearance very like a wasp. Owing to this fly being about when wasps are plentiful, it doubtless obtains some protection from this similarity.

Still more closely does *Volucella bombylans* mimic several species of humble-bee (*Bombus*), moreover it is subject to considerable variety, and each of the different forms exactly reproduces the colouring of a corresponding type of Bombus.

In Britain we have two varieties, distinguished by many entomologists as different species, *V. bombylans* and *V. plumata.*

Now in the former the thorax and abdomen are black, the thorax is covered with black hairs, while the tip of the abdomen is clad with hairs of an orange-brown colour. This is precisely the colouring of *Bombus lapidarius* and *B. rupestris.* In the latter, most of the thorax is clothed with yellowish hairs. There are patches of yellow on the sides of the abdomen near its base, while its tip is covered with whitish hairs—an arrangement of colour almost identically the same as in *Bombus lucorum*, *B. collinus*, *B. pratorum* and some others.

So much for the British forms of the fly, but it does not confine itself to imitating the colouring of only two kinds of Bombus. Baron Osten Sacken has kindly sent me a copy of a short review by him * of a Russian work by J. Portchinsky on the Diptera of the Caucasus resembling Bombus. M. Portchinsky finds that in the Caucasian mountains the humble-bees (*Bombus eriophorus*, *niveatus*, *Caucasicus*) are all characterised by the prevalence of white hairs on various parts of the body. The plain black and orange coloured humble bees, like *B. lapidarius*, are entirely absent. It is therefore remarkable that in this region the black and orange variety of *Volucella bombylans* is absent, as though it had no cause for existing, while in its place a variety (*V. bombylans*, var. *Caucasica*) is found, which is unknown elsewhere in Europe, and in which the thorax and the base of the abdomen are clad with white hairs, after the manner of the humble bees of the Caucasus. A translation of M. Portchinsky's work is much to be desired.

All entomologists are aware of the great resemblance which obtains between the hornet clearwing moth (*Trochilium apiforme*) and the hornet (*Vespa crabro*). Not less striking is the resemblance to the latter insect of a fly (*Milesia crabroniformis*) which, though not found in England, is abundant in many parts of France and Italy. It is exactly the size of an average hornet, the colouring of the thorax abdomen and legs is very nearly the same, while even the wings are of a brownish tinge, similar to that of the hornet's wing.

* "Wiener Entomologische Zeitung," i. (1882), Heft 9.

When first I saw one of those flies buzzing round a trellis at Mentone some seven years ago, I captured it under the impression that it was a hornet.

At Cadenabbia, on the Lake of Como, *Milesia crabronifornis* was a common insect, and although it was doubtless protected from the attacks of birds by its likeness to a hornet, it sometimes suffered for its resemblance, for I have seen the natives try to kill it, and no amount of explanation could shake their firm conviction that it was a hornet.

Thus in one family of Diptera we have flies mimicking several types of common Hymenoptera; the bee, the wasp, the andrena, two forms of humble bee, and the hornet. The similarity is so great in these instances, particularly when the insects are alive and in motion, that no doubt can exist that they are cases of protective mimicry.

There are, however, other instances of resemblance between Diptera and Hymenoptera on which it is not so easy to decide whether they be cases of mimicry or not.

Before concluding, I should like to mention two that have come before my notice. Comparing a specimen of *Myopa ferruginea* with a species of Nomada (probably *N. lateralis*), I was at once struck by their general similarity, and remarked that even the whitish patches on the abdomen of Nomada were represented by light spots on the body of Myopa. The likeness between these two insects has previously been observed by entomologists. The other case which occurred to me only just lately, is the resemblance between *Mesembrina meridiana* and some of the Anthophoræ, as *A. retusa.*

The fly, one of the Muscidæ, has rather curious colouring, it is entirely black, with the exception of the wings, which, though pale grey towards the tips, are of a brilliant orange-yellow near the base. The Anthophoræ are black, but collect a quantity of pollen on their hind legs. They are about the size of *M. meridiana.* Now is it not highly probable that the yellow at the base of the wings of *M. meridiana* reproduces, when the insect is flying, the appearance of the pollen on the tibiæ of Anthophora?

Whether the last two are cases of protective mimicry, could only be ascertained by open-air observation. If the flies are frequently seen associated with the insects they copy, or are found in similar places and seasons, we may fairly suppose them to be so. With regard to the Myopa, I fancy I have caught it and Nomada near the same spot, but as I knew scarcely any entomology at the time, and was quite a young boy, I may easily be mistaken. Were Diptera studied a little more, we should doubtless find numerous other cases of mimicry among them, including some that are now quite unknown. Let us therefore earnestly hope that some entomologists will employ their leisure in further investigations on this most interesting subject. G. H. BRYAN.

Peterhouse, Cambridge.

THE GRAPE HYACINTHS OF SWITZERLAND.

WE have previously remarked* that the English "blue-bell" (*H. non-scriptus*) does not grow in Switzerland, but this does not apply to the several species of Muscari, which are only too plentiful in the Swiss vineyards. Towards the end of March, as we pass by the vine-clothed slopes, an oppressive odour is perceptible in the air (which is said to resemble plums); it is carried from the thousands of grape hyacinths, which literally cover the broken ground between the vines, and resist every effort made to exterminate them. If once this species, *Muscari racemosum*, becomes rooted in the soil, it spreads in the most prolific manner, as shown in the figured specimen. The plant is bulbiferous, each tiny bulb detaching itself from the parent root to start an independent existence. This single specimen had no less than twenty-four vigorous little bulbs attached, a clear proof of the rapidity of reproduction. It was the first plant that came handy for examination, not being in any way remarkable for size. The species may at once be identified by the scent and by the peculiar form of the leaves, which are channeled, curling up in such a manner that they might be mistaken for those of an Allium. The flowers, of a dull purplish-blue, are crowded in a raceme, the upper ones being abortive; the stem stands erect, one or more from each bulb. Another species, *Muscari botryoides*, is not nearly so commonly distributed, occurring more in shady woods than in the vineyards. From the drawing, it will be noted that the bulb is of different shape, not budding young rootlets in the wholesale manner as *M. racemosum*. The raceme of blue flowers is more graceful-looking in *M. botryoides*, the abortive terminal buds having a decided pink tinge. The leaves, though slightly channeled, are linear-lanceolate, and do not coil up, as in the other species. We have found these two species very generally confused, whereas the distinction is well-marked, as an examination of the two plants together quickly testifies.

* SCIENCE-GOSSIP, No. 244, p. 83.

Fig. 164.—*Muscari racemosum*.

Muscari comosum, the feather hyacinth, is a strange-looking plant. Visitors to the south of France must have been struck with its appearance, growing from every wall in such profusion. The flowers are shortly pedicelled, of a livid brown colour as regards the fertile ones, which form the lower part of the loose

raceme, while the larger-stalked, blue, sterile flowers crown the terminal part of the raceme, waving in the air like feathers. The leaves of this plant are large and broad. It is found in the vineyards and in rocky situations. The *M. neglectum* of Dr. Bouvier's "Flore Suisse" we have not been able to meet with. The yellow-flowered *M. moschatum* (Desf.) is, we believe, a species known in France, but not included in the Swiss flora.

Fig. 165.—*Muscari botryoides.*

Fig. 166.—*Muscari comosum.*

GENUS MUSCARI, Tournefort.

A genus of the Liliaceous order, tribe *hyacinthée.* Bulbous plant ; segments of corolla united, or almost imperceptibly divided into six points ; cylindrical, contracted at the rim ; six stamens inserted on the tube of the perianth ; capsule triangular.

1. *M. racemosum*, Mill. (starch hyacinth). Bulb ovoid ; proliferous. Stem shorter than leaves ; leaves linear, curled up. Flowers in dense raceme ; upper ones abortive ; purplish-blue, strongly scented.

2. *M. neglectum*, Gussone. Larger growth than the preceding species. Leaves larger, not curled up, raceme loose ; each flower pedicellated (given by Bouvier as a distinct species, but perhaps a variety).

3. *M. botryoides*, Mill. (grape hyacinth). Bulb ovoid, conical ; stem equal to leaves in length.

Leaves channeled, but linear-lanceolate, not curled; flowers in dense raceme, blue; upper and above flowers pink-tinged; teeth of corolla white and well-marked.

4. *M. comosum*, Mill. (feather hyacinth). Bulb ovoid; leaves large and spreading; racemes prolonged and loose. Lower and fertile flowers livid brown; upper ones, long-stalked, crowning raceme like feathers, abortive, and of blue colour.

It is now but the commencement of April, but other plants of the Lily order are in leaf, and will shortly be in flower in the neighbourhood of Montreux. We have noted species of Tulipa, Scilla, Allium, Ornithogalum, Gagea, Erythronium, and Lilium already far advanced in growth. If there are botanists among the readers of SCIENCE-GOSSIP who wish to visit the upper end of the lake of Geneva at the best season for the flowers of the lower Alpine slopes, we strongly recommend the month of May as the time of year most suitable. The Hôtel les Avants, 3200 feet above the sea, and about 2000 feet above Montreux, is a very Paradise for botanists, and in May the slopes of surrounding mountains are a very blaze of colour from the brilliant succession of Alpine flowers.

C. PARKINSON.

Montreux.

NOTES ON NEW BOOKS.

DICTIONARY of the Names of British Plants, by Henry Purefoy Fitzgerald (London: Baillière, Tindall, & Cox). This little book is calculated to be of great use to botanists, especially to self-taught students of the science. It gives the generic and specific names of British plants arranged alphabetically, with the derivation where known, and the pronunciation. In the case of specific names, the name of some plant is also given to which the specific name applies. It is from no desire to find faults that the fact is pointed out, that there are no accent marks given in the pronunciation-words. Doubtless in most cases the length of the vowels is practically sufficient, but the word *Helosciadum* at least might be accented in several ways. *Silaifolia* might be inserted in the next edition.

British Butterflies, Moths and Beetles ("*The Young Collector*"), by W. F. Kirby (London: Sonnenschein & Co.), 1*s*. This book begins with a brief outline of the class Insecta, with examples and figures under each order. The rest of the book is divided into two parts, in which are treated at greater length British beetles and British butterflies and moths. Brief descriptions are given as well as numerous woodcuts, while in the case both of general entomology, and of butterflies and moths, a short list of books likely to be useful to beginners is given. There is neither a table of contents nor an index.

Our Insect Enemies, by Theodore Wood (London: Society for Promoting Christian Knowledge). In this little book the author has attempted, he says, to trace the life histories of injurious insects, pointing out how they are injurious, and as far as possible the range and extent of their ravages, treating them for the most part in the order of their present system of classification rather than in accordance with the particular crops they frequent. The book is uniform in general appearance with the Natural History Rambles series, and like some of this series unfortunately has no index, a defect only partially remedied by the detailed table of contents. The Aphis or "Green-Blight" has four chapters to itself, in which its structure and life-history are taken up, and various individual species noted. Cockchafers, wire-worms, weevils, turnip saw-fly, and many other injurious insects, including butterflies and moths, follow on. The clothes-moth is omitted on account of the limited character of its ravages and its beneficial influence out of doors. The book, which is illustrated with woodcuts, contains much that should be commended to the notice of all who have to do with raising crops, for it is almost entirely with out-door life that it is concerned.

Scientific Romances, No. II.—The Persian King, or The Law of the Valley, by C. H. Hinton, B.A. (London: Swan Sonnenschein & Co.), 1*s*. The clever author of "What is the Fourth Dimension?" has here produced another scientific romance, his ostensible topic this time being Energy and its dissipation. His book requires to be read with attention and care, and the fact that he has supplied an explanatory second part may be taken as evidence that he does not consider the allegory in the first part as likely to sufficiently explain itself. The inhabitants of the valley in which the Persian king finds himself have a tendency to apathy, the pleasure of doing anything being exactly equalled by the accompanying pain. The king, however, can make them act, by means of a power with which he is endowed, of taking upon himself some of the pain attending any action which he wishes performed, leaving thus an excess of pleasure which causes the performance of the action. Now the king corresponds more or less to a certain supposed ultimate medium, which, according to the view here propounded, is the cause of all motion. The second part of the book should be read by every-one interested in questions of physics; and if the reader afterwards turns to the first part he may find there, whether he understand them or not, passages which imply that the writer includes in his subject higher things than physics.

A Tour in Sutherlandshire, with Extracts from the Field-Books of a Sportsman and Naturalist, by Charles St. John, *with Appendix on the Fauna of Sutherland*, by J. A. Harvie-Brown, F.Z.S., and T. E. Buckley, F.Z.S., 2 vols. (Edinburgh: David Douglas). This is the second edition of a work issued between thirty and forty years ago, the author being an ardent

student of animal life in days when the evolution theory had not made its way into the conceptions of animal history as it has now. He was a sportsman pure and simple, seldom killing for killing's sake, and, though one may not always take his view, it is impossible for a lover of nature not to be interested as the author carries him along with pleasant discourse of eagles and ospreys, wild swans and their ways, seals, otters and foxes, not disdaining frogs, and cats, and sparrows. Mr. St. John was rather too anxious to shoot ospreys, and was, indeed, somewhat inconsistent with his own remarks in doing so; and to the hooded crow he was a determined enemy. His style is very readable, and on the whole these volumes are as pleasant a sportsman's record of animal life as one is likely to find anywhere. The little pen-and-ink tail pieces are many of them delightful. The tour is contained in about half the first volume, and is followed by field notes for the different months and extracts from note books. The Appendix by Messrs. Harvie-Brown and Buckley concludes the second volume. A word or two of praise should be devoted to the printing, paper, and general get up, which makes the contents of the sombre covers pretty nearly all that can be desired from this point of view.

First Year of Scientific Knowledge, by Paul Bert, translated by Madame Paul Bert (London: Relfe Bros.), 2*s.* 6*d.* It is announced in the very short preface to this, its English edition, that there is scarcely a school in France, even in the smallest village, where "M. Paul Bert's famous book" is not used. It is to be inferred from this, from the title, and from the book itself, wherein Paul, George, Harry, and James are duly informed of a vast number of facts, that it is intended for young children. Here, in rather less than 350 pp., one has animals, plants, stones and soils, physics, chemistry, animal and vegetable physiologies, discussed and laid aside in succession. It is, after all, but little more than a page a day for the young children, and the illustrations are so many and so entertaining, some so really good, that if by the end of the year the child is not a botanist, a physicist, &c., in little, the failure should perhaps be laid to the door of the system, which is not that which has of late years been advocated as the true method of studying science. It is really wonderful what is here provided, ready cut and dried for the children to swallow, if only they can hold it all. The book is a phenomenon worth considering. Its illustrations, of which there are said to be 550, are many of them attractive, though all are small. That of the sheep's jaws happens to be printed upside down, and unfortunately that intended to explain the apparent movement of a penny in a vessel when water is poured in, is quite wrong, and that in more ways than one; and here the text also is not free from blame.

An Elementary Star Atlas, by Rev. T. H. E. Espin, F.R.A.S. (London: Swan Sonnenschein & Co.). This is a book of star maps and text, the maps on the right-hand page and the text on the left. The book is light to hold, and the stars are marked in black, large enough to be seen on the white paper in a dull light. The book is specially intended for beginners, but it is only fair to warn the beginner that he will probably find it necessary to give his careful consideration to the method on which the book is constructed. There are twelve maps, the places where January and July would be expected being occupied by circumpolar maps (north pole). Should a second edition be called for, it is to be hoped that various matters of more or less consequence will be attended to, and so the usefulness of the book be increased. A preface is supplied by Mr. J. A. Westwood Oliver, editor of the "Illustrated Science Monthly."

THE ECONOMICAL PRODUCTS OF PLANTS.

By John T. Riches.

CAMPHOR.—This valuable commodity is the produce of *Cinnamomum Camphora*, Nees et Eb. (*Camphora officinarum*, Nees), a native of China, chiefly near Chinchew, in the province of Fokien, also very plentiful in Formosa, and some parts of Japan, the principal supplies of the material coming from the former part by way of Singapore to this country. It is a large tree (Fig. 167) belonging to the laurel family (*Lauraceæ*) with a straight trunk, freely branched at the top, all the parts when bruised emitting a camphoraceous odour. Leaves alternate, on long petioles, ovate-lanceolate, subcoriaceous, entire, bright green above, paler beneath, three-nerved. Flowers in lax axillary and terminal panicles, small, bi-sexual. Fruit small, roundish, drupaceous.

Camphor, like most substances the produce of countries southwards or eastwards of India, was unknown to the ancients. It was, however, known to the Arabs, who called it "*kaphoor.*" It is diffused throughout all parts of the tree, hence all, with the exception of the leaves, are used in the process of procuring it: root, stem, and branches are cut up into convenient lengths, and boiled in water in large closed vessels, when the volatilised substance is sublimed into inverted cones of straw placed within earthen capitals. In this form it is collected and imported into Europe, and is known as crude camphor, mainly from the parts mentioned above, but some of good quality is obtained from Japan, which is, however, chiefly secured by the Dutch, amounting in some years to several thousand pounds. It exists in this stage in the form of small greyish-coloured sparkling grains, which by aggregation form crumbling cakes, with all the properties of pure camphor, but mixed with impurities. After its importation all these are removed by another process, after which it assumes the form in which it is usually

seen in commerce. The raw material is mixed with lime, and again sublimed into glass vessels of a special shape, which are ultimately broken away, leaving the camphor in the form of concavo-convex cakes from two to three inches thick, with a hole in the middle; when it is solid, colourless, and translucent, with a penetrating aromatic odour, and a bitter pungent taste, with a crystalline consistency. Its specific gravity is less than that of water, consequently it floats on water, and evaporates, undergoing a curious rotary movement while doing so; but little soluble in water, freely so in alcohol and ether, also in volatile and fixed oils. At ordinary temperatures it slowly evaporates and crystallises on vessels in which it is contained, as in glass jars for instance. It melts at a temperature of 288°, and boils at 400°, is very inflammatory, burning with a blue flame.

The uses of camphor are very numerous, and its actions are equally various. When taken internally its action is chiefly upon the nervous system, in moderate doses producing exhilaration, quietude and placidity of feeling, allaying irritation. In large doses the circulation, especially in some persons, such as those suffering from heart affections, may be effected in a similar way, passing off afterwards through the skin and bronchial membranes, but not by the urine. In excessive doses it is narcotic and poisonous. It is chiefly employed in medicinal practice as an anodyne in nervous affections and hysteria, and in nervous and typhoid fever. If taken in small quantities in solution, it is said to strengthen the teeth. It is employed in domestic economy as a protective agent against the attacks of insects, and for a similar purpose by natural history collectors. It is frequently used as a preventive against infectious diseases, although its power in that direction is not great.

Borneo or Sumatra Camphor.—This is another variety of camphor produced by *Dryobalanops aromatica*, Gaert., belonging to the distinct family *Dipterocarpeæ*, and which was for a long time erroneously supposed to be the tree which produced the kind met with in European commerce. This tree also yields the oil of camphor, or liquid camphor, as it is frequently called, which is obtained by incision from the younger trees, a practice which eventually destroys the trees. It has, however, the same properties as the solid camphor, and would have ultimately developed into that substance if the trees had been left unmolested. The solid camphor of this tree is found in the cracks of the bark in large blocks, varying according to the age of the tree; and to obtain it the trees are cut down, split into blocks, and the camphor extracted. In the Museum No. 1, in the Royal Gardens, Kew, the crystallised camphor is shown *in situ* upon the wood, so there is a great difference between the development of camphor in the

Fig. 167.—*Cinnamomum Camphora*, Nees et Eb.

two species; for while this is naturally prepared, that from *C. Camphora* is obtained by artificial means. It possesses the same properties as the produce of *Cinnamomum*, although it does not evaporate so readily at ordinary temperatures, and its crystals are of a different form. It does not find its way into this country, as it is eagerly bought up by the Chinese at a most exorbitant price, exceeding many times the value they receive for their own produce, although, in the eyes of the European, it is of no greater value. But the Chinese attribute many and excellent virtues to it for which they are ready to pay, and who would forbid them enjoying the opinion at their own cost?

THE PAPAW-FRUIT (Fig. 168).—This is produced by *Carica Papaya*, Linn., belonging to the family *Papayaceæ*. It is now widely distributed and cultivated throughout all tropical countries, but there is no doubt

Fig. 168.—Fruit and Leaf of *Carica Papaya*, Linn. (reduced.)

it emanated originally from the Western hemisphere, as students of the new world flora now regard it as a native of Tropical South America. It is a small tree, seldom exceeding twenty feet in height, with a straight unbranched stem, about a foot in diameter at the base, where it is moderately hard, but soft and spongy at the top, and hollow in the centre. The leaves are situated at the top of the stem, on long petioles, diverging almost horizontally from the stem; the blade is as much as two feet in diameter, deeply cut into seven lobes with their margins again cut and sharp pointed. Flowers in racemes produced at the base of the leaf-stalks. Fruit oblong, from eight to ten inches long, three to four broad; or shaped like a melon with projecting angles, of a dull orange-yellow colour when ripe. The fruit is edible, but rather insipid, and is eaten raw in small quantities, but largely consumed in many parts, when cooked and flavoured with salt, pepper, and sugar; it is also employed in sauces, and preserved in sugar, especially in the West Indian Islands. The unripe fruits are also pickled, and boiled and eaten as a vegetable prepared in a similar way as turnips are in this country. Throughout the latter part of the globe, the juice of the tree, or an infusion of the fruit and leaves, has a remarkable reputation for rendering the toughest meat tender, as it possesses the power of separating the muscular fibre. Sir Joseph Hooker says "the whole tree possesses this remarkable property." The exhalations emanating from it also have the same power, and fresh meat hung up in the branches is made tender in a surprisingly short space of time. This practice is largely resorted to in the West Indies. It is also stated that if old hogs and poultry are fed with the fruit and leaves their flesh is rendered extremely tender. The juice of the fruit is used by ladies as a cosmetic for removing freckles from the face, but its most important are its vermifugal properties, it being largely employed as an effective vermifuge; it is also antiseptic.

According to the analysis of the juice by Vacquelin, it contains fibrine, a substance characteristic of all animal tissues, but which occur in other vegetable tissue besides that of the Papaw. The root has a very strong and disgusting odour, similar to that of decaying radishes, and is very acrid, a clear indication of the vermifugal character of the juice. The leaves are employed by the negroes as a substitute for soup. So the uses of the plant are manifold, and for other details respecting it I must refer my readers to the "Botanical Magazine," 2898, where a good plate is given. The plant itself is also cultivated in the Royal Gardens, Kew.

The acidity is infused, in a greater or less degree, throughout all the species. In *C. digitata*, a Brazilian species, known under the native name of *Chamburu*, it is most prevalent, and the tree is regarded by the natives of Mayna with as much dread as the upas tree by the Javanese; in this instance with more propriety, as its juice is very poisonous. Pöppig says "that the juice which spirted over his hand when he cut the tree caused itching on the face, and drew a few blisters on the hand." The male flowers are said by Dr. Lindley to have the disgusting smell of human excrement. And what is very remarkable is the fact, that the fruit, although handsome, scentless, and insipid, is untouched by birds or any other creatures, except a species of ant belonging to the genus Atta.

(*To be continued.*)

FRESH-WATER SHELLS.—Mr. H. Wallis, Kew, has sent me some shells identical with those found by Mr. Goulding, attached to the feet of newts and frogs and recorded in the October number as (?) *Cyclas lacustris*. They prove to be *Sphærium corneum*, and not *S. lacustre* (*C. lacustris*). It will be well to record this, to prevent error.—*T. D. A. Cockerell.*

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

PROFESSOR HENRY DRUMMOND has propounded a theory concerning the white ant which is interesting. He states that there can be no succession of crops "without the most thorough agriculture," and that where man is not doing this work, nature employs other agents. Darwin has shown how the soil of England is tilled by earthworms to the extent of having ten tons of dry earth per acre annually transferred from below to the surface, by passing through their bodies and deposited as their casts. But in tropical countries, where the soil is hard baked by the sun during eight or nine months of the year, and too dry for worms to operate, other agencies are demanded, and Professor Drummond finds one of remarkable efficiency in the termite, or "white ant" as it is called, though it is not an ant at all.

The working termites are blind, and guarded while working by soldiers with eyes. They cannot live above ground on account of their blind helplessness against the many foes whose hunger they are specially qualified to satisfy, but their food is above ground. They eat dead wood, and all kinds of dead vegetable matter, but seem incapable of feeding on living plants. To reach the dead branches of a living tree, they build galleries or tunnels running up the stem, these tunnels being made up of minute pellets of earth brought from below and cemented together. As is well known, their ordinary structures assume great magnitude, mounds, cones, and strange fantastic edifices all composed of subsoil brought upwards. This action is doubtless similar to that of our earthworms, but there is a serious difference otherwise; as the earthworms work for themselves, and others at the same time; and their wages are very small. The damage they do to man and other animals is barely measurable, but the termite is a terrible devastator, he levies black mail on the food, the dwellings and furniture of man (under favourable circumstances a colony can devour a four-post bedstead in twenty-four hours), and of other animals, to such an extent that, in spite of their subsoil ploughing, their extermination from the face of the earth would doubtless be voted a great blessing by an overwhelming majority of men and other tropical animals, if a fair plebiscite could be taken.

The state of the Lea, of the Thames, and I may add of the Brent in my own neighbourhood, during the past summer months, shows how largely we are dependent on the flushing action of rain for the removal of sewage poison under our present arrangements. This flushing action of rain-water is evident to everybody, but there is another action that is invisible, and therefore far less widely understood. I refer to the purifying action of the oxygen contained in water that has been freely exposed to the atmosphere. A gallon of such water, at the winter temperature of 45° Fahr., contains 2·2 cubic inches of oxygen; at summer temperature of 70°, 1·8 cubic inch. This oxygen is a most efficient disinfectant; its efficiency in effecting complete purification is simply a question of quantity.

Thus the mere dilution of sewage does something towards its purification, and in addition to this the mixture of water and sewage picks up more oxygen as it travels along the course of a river. It has been estimated that water containing 32 per cent. of sewage is completely disinfected in the course of a journey of one mile, but I may qualify this estimate by adding that the water must be very shallow for this to occur. The case is very different where the sewage of London mingles with the deep water of the lower Thames.

Old-fashioned treatises on Natural Philosophy included "porosity" as one of the general "properties of matter." Thus Dr. Lardner says, "there is no substance so dense as to be divested of pores. The celebrated Florentine experiment, performed at the Academia del Cimento in 1661, and often repeated since that time, with the same result, showed that gold itself has sufficiently large pores to admit the particles of water to pass through them." This experiment was made by filling a globe of gold with water, closing it with a screw, and then squeezing down the globe with a powerful screw. The diminution of its capacity caused a forcing of the water through its pores, the water appearing on the outer surface.

Further experiment, however, shows that such pores are merely accidental, due to the fact that the metal was cast, and to the conditions of the cooling of cast metal. By hammering or rolling the gold, such pores are filled up. In the "Gazetta Chimica Italiana" is an account of experiments by Sig. A. Bartoli, proving the absolute impermeability of glass to gases under a pressure of 126 atmospheres.

As everybody knows, a very large proportion of the show at the "Inventories" contained no element of new invention whatever, and these mere shop-front cases by their bulk and prominence, dwarfed the really interesting demonstrations of the triumphs of modern invention. Among these are the coal-tar products, of which alizarin may be named as one of the most remarkable and important. Mr. S. B. Boulton, chairman of the British Alizarin Company, states that the yearly consumption of 20 per cent. strength alizarin in Great Britain now amounts to 3400 tons. A ton of this does the dyeing work of eighteen or twenty tons of madder root. At the lowest estimate the alizarin we use in Britain represents 61,200 tons of madder. The cost of this at the average of old prices (from 1860 to 1876) would be £2,907,000, while that of the artificial alizarin is £456,960, thus effecting a saving of nearly two and a half millions per annum in the mere dyeing of some of the colours of some of our textile fabrics. Alizarin is not an imitative substitute for the tinctorial principle of madder, but a production from coal tar of the actual thing itself. Its production was due to no-

mere accident, but to a series of profound chemical deductions with which the names of Perkin, Caro, Graebe, and Liebermann (especially Perkin) will ever be honourably associated. Dr. Perkin's achievements in the direction of *à priori* theoretical prophecy, followed by practical realisation, have been by no means limited to such production of alizarin; they were preceded by the earlier aniline colours, and are likely to be followed by further results of a similar character obtained by similar means.

The great international bore proposed by M. J. J. Martinez has been ridiculed by some, but more thoughtful people regard it very differently. M. Martinez asks for a universal subscription to defray the expenses of boring a hole 150 feet in diameter vertically downwards, from the centre of which are to be driven convenient stations, chambers, or tunnels, for the observation of subterranean phenomena. Such a shaft, besides displaying a grand geological section, would help us to determine many of the vexed questions concerning the internal heat of the earth, the probable thickness of its solid crust, the phenomena of internal earth-tides, &c., all of which are intensely interesting to every intelligent man whose whole soul is not completely enveloped in the calf-skin of his ledger.

The proposal to emancipate the ring finger from the thraldom of its immediate neighbours, by cutting through the oblique accessory tendon which renders its independent action so trammelling to pianoforte players, is by no means favourably received by "The Lancet." The improvement of the "execution" of high class pianists is doubted, on the ground that what would be gained in range of action, would be lost in power, and it is further suggested that the division of the lateral bands may be followed by cicatricial union of their severed ends; and again we are told that the records of surgery abundantly prove that no wound can be inflicted with absolute certainty of freedom from mishap in the shape of suppuration, or, it may be, greater evil; and certainly tendons are not the structure least liable to resent operative interference. On the other hand, we are told by the Scientific American (quoted in "Knowledge" Oct. 2, with engraving of the structure) that Dr. Forbes has performed fourteen entirely successful operations. Still, if I were an eminent pianist dependent on my ten fingers, I should say to them that we will

> "Rather bear those ills we have
> Than fly to others that we know not of."

The failure of the Eucalyptus experiment in the neighbourhood of Rome, where they were planted to counteract the malaria, is disheartening. The eucalyptus flourishes, and the malaria continues. A government commission of enquiry has been appointed on the application of Dr. Tommasi-Crudelli, who regards the facts as instructive, "proving, as they do once more, to what risks of mistake we expose ourselves to, if we hold *à priori*, that the methods which have resulted in a permanent improvement of one locality, can be usefully applied to all." He accordingly recommends the exercise of that faculty which distinguishes the philosopher from the vulgar theorist, viz. the suspension of judgment until a broad basis of fact has been obtained. The physical conditions and chemical composition of malarious districts vary considerably, and therefore the remedial measures should be modified accordingly. The eucalyptus has been beneficial in some places, though not in others. If the commission succeeds in determining the cause or causes of this difference, they will then learn where to plant the eucalyptus, and where to adopt other measures.

Dr. Tommasi-Crudelli recommends arsenic acid, and the alkaline arseniates as the most efficient protective agents against malaria. I have long advocated the same, and have practically acted upon it, by selecting wall papers containing a limited quantity of that popular bugbear, arsenical green pigments. My conviction was originally based on observations made in Birmingham when I lived there. Arsenical fumes are given off from brass foundries. Birmingham has escaped from cholera, in spite of the "back houses" and "party pumps," which until lately were so abundantly in immediate contiguity to back-yard domestic cesspools. The same has been observed in other places where brass foundries and copper and zinc smelting abound. Other zymotic diseases besides cholera fail to visit these places. Copper and zinc ores, and ordinary samples of the metals themselves, contain small quantities of arsenic which is a volatile metal vaporising at the melting temperature of the constituents of brass, and of brass itself. In "The Gentleman's Magazine" of April, 1881, I said and now repeat, that "if I lived in New Orleans, or any other focus of fever horrors, I would envelope myself to a certain extent in arsenical fumes, by covering my walls with highly-charged arsenical papers, furnishing my rooms with arsenical upholstery, and carrying arseniuretted pocket handkerchiefs; carefully observing the effect in order to stop short at the first warning symptoms of arsenical poisoning."

FREEZING MACHINE.—If J. P. can manage to see Dr. Ure's "Dictionary of Arts, Manufactures, and Mines," edited by Robert Hunt, F.R.S., and published by Longmans, 1867, he will find a full account of "Carré's Continuous Freezing Machine," in vol. ii., p. 401, 402. In a Carré-Leslie machine, containing 2·5 kilogrammes of sulphuric acid, 4·8 kilogrammes of water can be frozen; after which the acid must be renewed. Concerning the ammonia query:—One gramme of water, at 0° C., and under a pressure of 760 mm., absorbs ·877 gramme of ammonia, that is, 1149 times its volume of gaseous ammonia. This solvent will have a sp. gr. ·88, and freezes at −38° C., forming an odourless jelly-like mass.—*Dunley Owen, B.Sc.*

ON THE DEVELOPMENT OF A FLEA'S EGG. (*PULEX IRRITANS.*)

MICROSCOPISTS have perhaps been the only class who ever regarded this insect with any degree of favour, and that, only of a posthumous kind, when duly balsamed, and prepared as an object of investigation for their favourite instrument, but its life-history up to maturity, beyond which it might not be altogether pleasant to pursue it, is of the most interesting and instructive character ; and as least is popularly known about the earlier period of the flea's existence, I purpose in this paper and accompanying sketches to submit only what is the result of direct and careful personal observation, so far as the nascent stages of the development of *P. irritans* are concerned.

In our climate, as compared with warmer regions, the supply is not exuberant, and a careful housewife soon reduces it to a minimum, but, in hot weather, among the dried weed by the seashore, fleas may occasionally be seen in astonishing numbers, still, nothing to equal the myriads infesting warehouses and other buildings in tropical countries, on emerging from which the visitor finds it desirable to brush away the superfluous swarm from his clothing. How they subsist, seems a mystery, as a sanguinary diet appears to be impossible.

Mr. W. M. Williams writes in SCIENCE-GOSSIP, December, 1884, "I have found fleas in limestone caverns, or, rather, they have found me, where no other supplies of food existed, excepting the animal matter that may have remained in the fossils of which the limestone was chiefly composed." Such a diet would, however, be more suitable to the mandibular than the suctorial stage of the flea's existence ; possibly after completing its metamorphosis *pulex* may live long enough to deposit eggs, without any opportunity of practising phlebotomy, and so maintain its swarms without diminution.

In point of size our familiar *P. irritans* is a mere pigmy compared to its relative *Pulex imperator*, a solitary example of which appeared most inexplicably

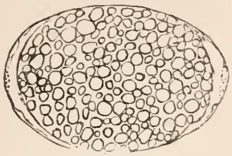
Fig. 169.

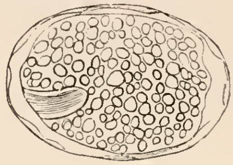
Fig. 170.

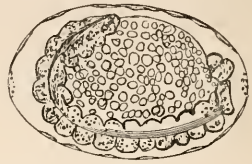
Fig. 171.

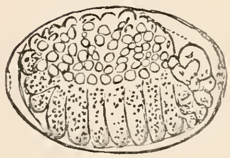
Fig. 172.

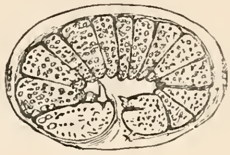
Fig. 173.

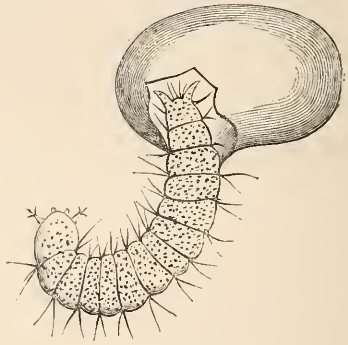
Fig. 174.


Fig. 176.

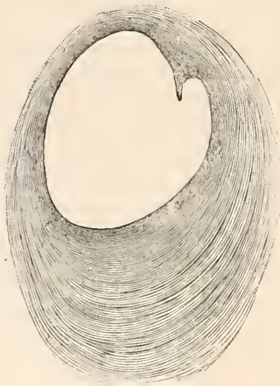
Fig. 177.

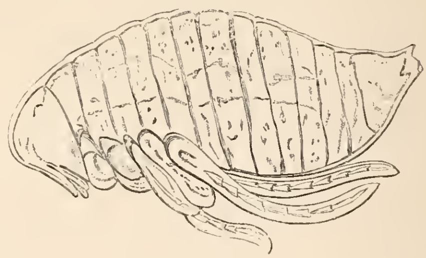
Fig. 178.

Figs. 169 to 179 showing stages in the Development of the Common Flea (*Pulex irritans*).

in a house at Gateshead—as recorded by Thos. John Bold, in the "Transactions of the Tyneside Naturalists' Field Club," 1857 : "*Pulex imperator*, Westwood. A friend of mine resident in Gateshead, brought an immense flea, which he had found in his bed, for my examination. Not being able to identify it, I forwarded the creature to J. O. Westwood Esq., by whom it has been described as new, under the above appellation, in a paper recently read before the Linnean Society." Mr. Bold remarks that this flea was at "least ten times the bulk of the common species. One consolation, however, I must not omit to mention, to wit, the fact that he was dead when found, and that, so far, no heirs of the imperial line have turned up to claim the family honours ; let us hope that he was the last of his race."

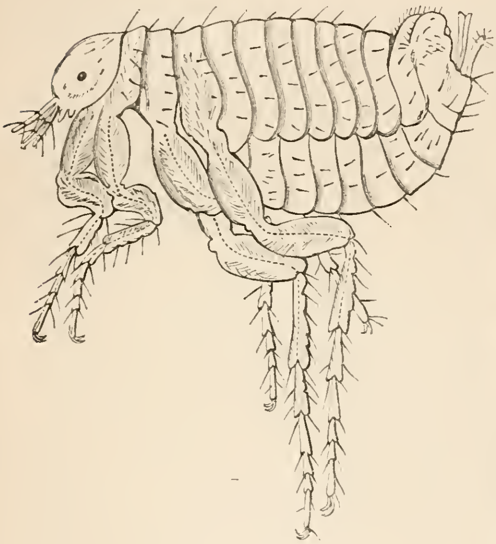

Fig. 179.

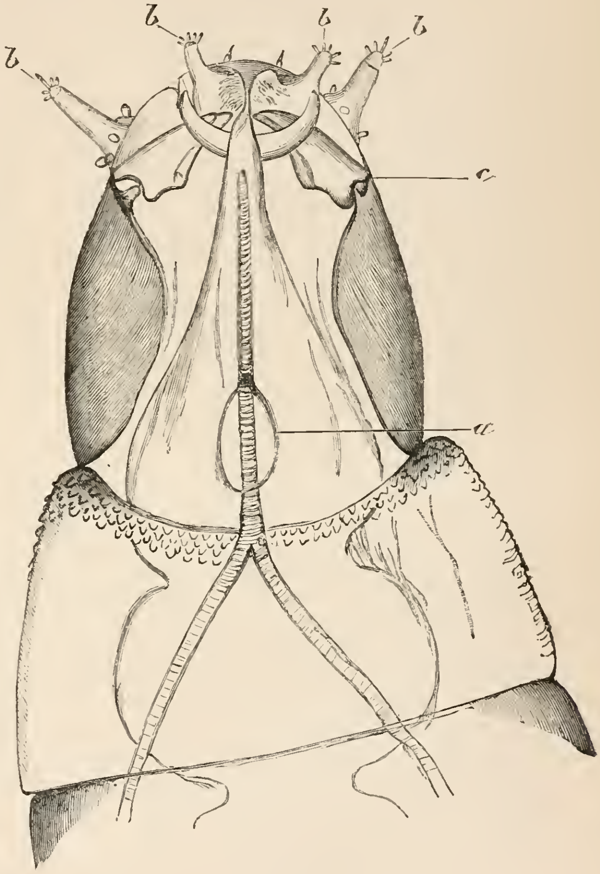

Fig. 175.

After considerable perseverance, Mr. George Harkus has succeeded in maturing a few examples of *P. irritans* in captivity. It would appear that when fleas are permitted to manage their own affairs, they become far too prolific ; but it has only been by a series of patient and repeated trials, that Mr. Harkus obtained pupa from imprisoned progeny. Brood fleas were of course essential in order to begin *ab ovo*, these were placed in glass tubes, or glass-topped boxes, a piece of cloth being laid at the bottom for the reception of the eggs. In order to economise space, two egg-laden females were located in one box, but this arrangement was promptly objected to by the captives, who at once became rampant, confronting each other like microscopic kangaroos, and instantly seized hold by the head and thorax with the keenness of well-bred terriers ; the battle was a drawn one, as after some tugging about the box, the belligerents were accommodated with separate apartments. This exhibition of pugnacity was quite a new feature, and afforded considerable amusement.

The tubes and boxes were kept moderately warm, and the fleas soon deposited their glutinous eggs, averaging a dozen from each individual, irregularly scattered ; the numbers varied from three, the smallest, to twenty-four, the largest, in each batch ; in colour the eggs are of a dingy white, in shape a flattened oval. They measure the $\frac{1}{40}$ of an inch in length, and in breadth the $\frac{1}{60}$ part of an inch.

With a very fine $\frac{1}{16}$ immersion objective by Swift & Son, Mr. Harkus was enabled to detect and count a spiral whorl of oval punctures, surrounding each end of the ova ; that these were depressions, and not merely surface markings was apparent from an edge view, when the surface presented a serrated aspect. About eighty of these spots pitted the end next the germinal vesicle,

and half that number the opposite end. These minute orifices measured the $\frac{1}{6000}$ by the $\frac{1}{12000}$ of an inch.

When first deposited, the eggs appeared to have already assumed the mulberry condition, the yolk being aggregated into spirules—ranging in diameter from the $\frac{1}{7000}$ to the $\frac{1}{2000}$ of an inch. The ova are so nearly diaphanous, that the process of incubation and development of the embryo, can, with an instrument armed with adequate power, be viewed throughout; when steadily watched the marvellous changes and differentiation of parts are wonderful in the extreme; and perhaps there are few objects of greater beauty and interest for the microscopist than that afforded by *pulex* in its nascent stage. (See Figs. magnified 50 diameters, Nos. 169 to 174.) In thirty-six hours the blastoderm is seen to occupy about one-third of the ovum's length (see Fig. 170) and next day the crenelated embryo has extended itself along one side of the egg, curving round the ends so as to surround three-fourths of the yolk; on the third day, the segments of the larva are distinctly differentiated, and may be counted; the yolk is now about one-half absorbed. The larva is coiled round, and almost fills the ovum on the fourth day of incubation, the head and thirteenth segment being nearly in contact, next day or sometimes on the sixth day it hatches out, and at once begins a very active and energetic existence.

The larva resembling elongated little worms are like other dipterous maggots, destitute of feet, they move continually with a lively serpentine action, occasionally rolling themselves into a spiral; on the anterior part of the head and in front of the mandibles, are four tubercles, each digitated on the apex with five spinous hairs in a straight line, with these they pull themselves forward; little tufts of hair also appear on each of the segments, probably protecting the spiracles, while the thirteenth segment bears hooks; all the processes apparently assist in locomotion; when placed upon the back of the hand a slight prickly roughness is felt, as the larvæ sway about with eager restlessness, doubtless in search of food; there are two small antennæ, but no perceptible eyes; there is also a spine tipped tubercle, on the back of the head, the oval base of which appears through the diaphanous structure.

All attempts to feed the larvæ were unsuccessful—flies living and dead were offered them, but remained unnoticed—they rejected whatever was placed beside them for food, and usually died in a few days; hence a chrysalis was a rarity, and one or two could only be occasionally obtained from a dozen maggots; when this occurred the pupæ were the only survivors, the other larvæ (having gradually disappeared without any means of escape) had probably been devoured. When favourably located they evidently find food in abundance, and where animals are infested with fleas the larvæ may possibly subsist upon the skin excretions, and thus to some extent act as scavengers. In Mr. Harkus's experiments, the rarity of cocoons was owing to inability to feed the maggots. No doubt if suitable food had been given, the greater number might have matured, and numerous repetitions of the attempt would have been spared; in spite of many failures the undertaking was persistently carried through; and the progress of the embryo sketched from its earliest stage onward. Any exposure of the larvæ to cold or damp was immediately fatal. This should be a useful hint to those who possess a superfluity of fleas, as by reducing the temperature of rooms so infested their numbers would be considerably lessened. The larvæ, as the pupa stage is approached, assume a red hue, and about eight days from hatching spin a cocoon like a fluffy speck of white cotton; the threads composing it are closely woven, and of extreme tenuity; when attached to a textile material similar in colour, these must be very difficult of detection. A cocoon from which the flea has issued is shown in Fig. 177. A cocoon was opened after the inmate had divested itself of the pupa case, but still remained enveloped in a filmy transparent integument; this pellicle covered the insect completely, following each leg and the antennæ continuously. The immature flea is shown as seen through this gauzy mantle in Fig. 178. This together with the chrysalis case, is left in the cocoon on emergence, which occurs in about nine days.

The translucency of the embryo flea, before becoming a pupa, so completely enables the internal structure and action of the various organs to be visible, that in point of actual interest there can be no comparison between the living entity and an object "Dead and buried and embalmed." Moreover, in closely and steadily watching and sketching the development step by step of any creature, the microscope is applied to its legitimate use—as a tool in the hands of the naturalist or enquirer. It will be seen that about four weeks is required to metamorphose the speck of vitalised matter contained in the minute ovum of *Pulex irritans* into a suctorial tormentor, which for its powers of annoyance, can neither be despised nor ignored.

M. H. Robson.

Raised Beach at Sark.—While visiting the Channel Islands last month, I went over from Guernsey to Sark. A geological friend with me pointed out what evidently appeared to be a raised beach. It is about 100 yards up the road, after going through the tunnel in the rock which leads from the landing-place on the east side of the island. We estimated the height of the raised beach at about 100 feet above the present sea level. Have any readers of Science-Gossip noticed this raised beach, or is it one well-known? I picked out shells from it looking exactly like some I had found on the well-known shell beach on Herm.—*Joseph Clark.*

NOTES ON THE LEMMING.

By John Wager.

[Continued from p. 233.]

IN 1881 I travelled in a northerly and north-westerly direction across Dalecarlia, Helsingland, Jemtland, and Ångermanland, to Svanäs, near Withelmina, in the south-western part of Swedish Lapland; and thence eastward, through Åsele to Nordmaling, near Urmeå, on the Bothnian Gulf, without seeing a single lemming, though on much of the route the almost continuous forests were intersected only by foot-tracks. Nor could I learn much about them on the way; at Soré, for instance, a person of whom I inquired, could only say, that on their occasional visits they came from the west and moved eastward—whence or whither was unknown; none, however, had been seen there for years. At Gisselås, farther north, the landlord said they appeared perhaps once in about ten years; where they came from was quite uncertain—he supposed from the mountains. Even the Lapp woman who presided over a kåta, in which I spent a night and day, upon the brow of the Blajk-fjeld, could give information scarcely more reliable. Lemmings, she said, had been seen on the fjelds two years since; where they had come from she did not know, but believed it was either from the sea or the upper air! A boatman also who rowed me down the Ångerman river to Stensele, said there had been lemmings in the neighbourhood some time since, but they had then "flitted." They were seen at intervals on the fjelds, and came there, he also supposed, from the sea!

On the second tour, in 1883, through the same tract of Lapland I entered it by tracing upwards from Hernösand, on the Bothnian Gulf, the course of the noble river Ångerman to its source in the great Malgomäj and Kult lakes—ascending to the head of the latter, among the mountains which form the broad boundary line between Sweden and Norway. So far I did not meet with a single lemming; but here, as at Wilhelmina, I was told they make their appearance in the valleys at intervals varying from two or three to six and even ten years; often their numbers are not very remarkable, but occasionally the predatory mountaineers descend in hordes which eat up all the grass, till, as a peasant expressed it, the ground looks *swart*. They are called, he said, the "land's plague;" when numerous the reindeer eat them, and contract thereby a sickness termed "renurina;" sometimes you may find multitudes of them upon the mountains, at other times none; and they migrate, he said, in different directions, at one time into Norway, at another into the Swedish dales. From Klimpen, at the head of the Kult lake, I walked across the wild and desolate tract which lies between the last house in Sweden and the first in Norway, a distance of about thirty-five miles of wilderness totally uninhabited, except by the wandering Laplanders, who pitch their tents in its elevated valleys and upon its mountain sides; now in one place and now in another, to suit the requirements of their reindeer herds. During this march twice or thrice I startled a lemming, usually among covert of creeping black birch or other bosky ground; and several times I heard, without seeing them, the shrill scream of others; but evidently they were not numerous, though no doubt this tract is one of their normal haunts. After entering Norway and descending to Kroken in Susendal, Helgeland, I had still eighty-four miles to traverse before reaching the coast at Vefsen. On this route, which was chiefly through forest, while walking one of the rather frequent stages where no carriage road existed, I met with a solitary lemming on a grassy slope in Hatfjeldalen, and supposed this elevated valley to be one of their usual resorts, but was afterwards told that such was not the case; that the lemming I had seen pertained to a swarm which had been there in the earlier part of the summer, it being now the third of July. In 1884 also I had a tolerably wide range through the forests and over the snow-patched mountains and bosky, morassy hollows of south Swedish Lapland, bordering upon Norway, and from thence to Ostersund in Jemtland, without seeing any lemmings, except the bodies of a few, at Fatmomak, which had evidently been dead a considerable time, having been trampled upon till they were dry and flat as mere skins.

The habitat of the lemming, according to Schjoth's "Geographisk Beskrivelse over Kongeriget Norge," is the birch and willow region of the mountains; and a Swedish friend, resident in the south of Lapland, informs me that the usual haunt or home of the lemming is some moderately dry place in the neighbourhood of the fens and morasses with which the Lapland mountain-tracts so greatly abound. As before said, I first saw them, and in numbers exceeding any I have seen elsewhere, upon the high table-land between Lœrdalsören and Urland; a desolate region of ruggedly undulating ground and cragged precipitous hills; white almost everywhere with infinitude of blanched stones; treeless, and in many parts almost devoid of any vegetation except purple lichens; but producing also grass and low herbage of other kinds. Being quite new to me they added greatly to the interest of my lonely walk, affording ample opportunity for observing their personal appearance and behaviour. The lemming is about five inches in length, exclusive of the tail, which is not more, and frequently less, than half an inch long; the legs too are very short—the fore-legs about half an inch, and the hind ones not more than one inch in length. The feet are furnished with claws. Its fur is fine, soft and close, but not, as I saw it in summer, very thick; in colour, brownish-yellow, or dull orange, at the sides, becoming

almost white under the belly; black and orange about the face; a large patch of black on the shoulders, from which brown-orange, intermixed more or less with black hairs extends over the back to near the tail—this portion having commonly a margin in which the black hairs predominate, and often a similar or more clearly defined dark streak extending through the centre of it from the black patch on the shoulders. Its tail is covered with stiff hairs, and stiff whiskers project from about its mouth. The eyes are small, and the ears are so short as to be scarcely perceivable among the soft fur. Its head in shape bears some resemblance to that of a Guinea pig.

Such are the bodily traits of the lemming; its mental qualities are still more strikingly marked. Among Norwegian peasants lemmings are very commonly called lomhunds (*hund* meaning a dog), and very pert and spirited little dogs they are—quick in movement, and active apparently by night as well as by day; for once, when benighted late in the year upon the Roldals-fjeld, while walking to and fro on a limited space of level ground to keep myself from freezing, I heard them running and squeaking about my feet at intervals all the night through. On the Urlands-fjeld when they saw me at some distance they ran to their holes at as quick a pace as their short legs would carry them; but if I came upon them unawares, as frequently happened, when they were squatting by the side of a stone, a tuft of heather, or dry grass, they made no attempt to escape, but uttered a shrill and startling shriek and scream, coming at the same moment as suddenly into view, with bent backs and uplifted heads; showing their two long front teeth and angry little eyes; violently shaking their bodies and limbs also with a most irritable, and irritating, movement—the result perhaps of fear and anger combined; and often they sprang fiercely at me or my stick to the alarming height of two or three inches from the ground. If their strength and size were equal to their pluck, they would soon rid the mountains of wolves, instead of supplying them with dainty morsels of fresh meat. When you present to them the end of your stick they bite it; and if you compel them to retreat, they move hinder-end foremost, contesting every inch of the way. Their own diet consists of different kinds of grass and other herbage, roots, leaves of the dwarf birch, reindeer lichen, and bark of trees; on the Urlands-fjeld, as before said, their favourite food seemed to be a small, rather thick and succulent leaf. It is said they will also eat insects. Their migrations, no doubt, are connected with the state of the food supply; without reading Malthus they become aware sometimes that population has a tendency to increase faster than the means of subsistence, and, therefore, to avoid starvation, quit their mountain fastnesses to invade the fruitful domains of man. How numerously, as already shown, has to some extent been witnessed by myself over an area of several hundred miles. But occasionally the numbers, and consequent depredations of the swarms, far exceed the limits of my experience. On this subject, Bishop Pontoppidan, in his "Natural History of Norway," published in 1753, has the following remarks: "Very prolific must these mischievous creatures be; as appears from what is seen of them, though, thank God! very seldom, namely once or twice in twenty years, when they come from their dwelling-places, collected in great flocks of some thousands, like the army of God, to execute His will, namely to punish the neighbouring inhabitants by the destruction of their corn and grass; for where this flock advances, making a perceptible track on the ground, they cut off all that is green they can come over, until they reach their destined goal, the sea, in which they swim awhile and then drown; for longer than one year God's faithfulness does not permit this plague—which moreover strikes only here and there in certain districts—to prevail; for they either, as is said, have an instinctive impulse to drown themselves, or also they succumb to the winter's cold, and the few which are able to survive till spring, die as soon as they eat of the new grass, which does not agree with them as before." This latter statement seems scarcely correct, as a man in Vestfjorddalen, Thelemark, where I saw them numerously in September 1862, informed me they had begun to arrive during the previous September; and though the bulk of those which I saw there had probably arrived later, they must, I think, have wintered somewhere on the way, having, in 1862, traced lemmings continuously on my route from the Hardanger district through the Thelemark; and in 1863, when they had quite disappeared from Vestfjorddalen, found a swarm of them farther south.

(*To be continued.*)

SCIENCE-GOSSIP.

THE address (reported in "Science") of the retiring President, Professor J. P. Lesley, at the meeting of the American Association for the Advancement of Science, held at Ann Arbor last August, presents so many points of interest that it would be well worth quoting largely. Speaking of what he says is technically known among experts as "dead-work," he says, "To describe dead-work is to narrate all those portions of our work which consume the most time, give the most trouble, require the greatest patience and endurance, and seem to produce the most insignificant results. It comprises the collection, collation, comparison and adjustment, the elimination, correction and re-selection, the calculation and re-presentation—in a word, the entire first, second, and third handling of our data in any branch of human learning,—wholly perfunctory, preparatory, and me-

chanical, wholly tentative, experimental, and defensive —without which it is dangerous to proceed a single stage into reasoning on the unknown, and futile to imagine that we can advance in science ourselves, or assist in its advancement in the world. It is that tedious, costly, and fatiguing process of laying a good foundation which no eye is ever to see, for a house to be built thereon for safety and enjoyment, for public uses, or for monumental beauty." . . . "And this fatal laziness is fostered by a strange misunderstanding, a fancy, sometimes a downright conviction, that the dead-work of science can be done for us by some one else, so as to save our time and strength for speculation, for thought, for fine writing; it can be done by menials, employees, assistants, colleagues, special experts,—by any one rather than by ourselves."

Professor Lesley urges an habitual performance of dead-work in the pursuit of science, and would enforce it if he could in the case of teachers of science. A crumb of comfort, since we are human, is afforded to the conscientious performer of good dead-work in the fact, that "although the most of it is necessarily done in secret and silence, enough of it leaks out to testify to his honest and diligent self-cultivation; and enough of it must show in the shape of scientific wisdom, to make self-evident the fact that he is neither a tyro nor a charlatan." And in original work "reap your field so thoroughly that gleaners must despair. Fortify your position, that your most experienced rival can find no point of attack. Lay your plans with a superfluity of patient carefulness that fate itself can invent no serious emergency. Demonstrate your theory so utterly and evidently that it shall require no defender but itself."

Among the papers in the biological section was one by Mr. J. C. Arthur, going to prove that bacteria are the cause of pear blight. His experiments had shown that the disease could be produced in a healthy tree by inoculation with sap from a diseased tree, and also by inoculation with cultures of the sixth generation; and further that wherever there is a blight not produced by freezing, bacteria of this species are always present.

The blue colour of the sky was said by Professor Nichols to be due not to an excess of the more refrangible rays in the reflected light, but to be subjective, he having previously pointed out that selective reflection need not be adduced, but that the rapidly increasing sensitiveness of the eye to violet, with decrease of illumination, was sufficient to account for the effect.

Three sentences from the abstract of the address by Dr. Burt G. Wilder of Cornell University to the biological section, should commend themselves to those who have charge of museums. He was speaking especially of specimens of vertebrate animals, but his remarks will bear extension. "Quality is more important than quantity, and arrangement is usually more needed than acquisition. True economy consists in paying liberally for what is wanted, rather than in taking what is not wanted as a gift. The usefulness of a specimen, and thus its real value is to be measured, not by its rarity or cost, but by the degree in which it exemplifies important facts or ideas."

In a recent number of "Science" an account is given of the lately completed Lick Observatory, built on Mount Hamilton, in the Pacific Coast Range, about fifty miles south-east of San Francisco. Mr. Lick, who had acquired a large fortune, left a bequest of 700,000 dollars for the erection of a great observatory at a mountain elevation, and the spot chosen is about 4,500 feet high. The whole will be handed over to the California University when the great telescope and its accompaniments have been completed. A flint glass disc thirty-eight inches in diameter has been made, though not yet worked into shape, and a disc of crown glass is now the desideratum. Popular attention will assuredly be directed towards its performances, if, as is here suggested, it may, under favourable circumstances, make the moon appear as if a hundred miles away, and render visible objects there no larger than some of our larger buildings.

A rapid perusal of a paper by Mr. W. J. Simmons, which forms a recent number of the "Journal of the Health Society for Calcutta and its Suburbs," certainly leaves the impression of wonder that folk can continue to live there at all, if there be anything in the sanitary theories now so prominent. It almost seems, as the writer says, as if dirt cannot be so injurious as the doctors say. The conditions under which clothing is washed in tanks of filthy water, the dirty state of the native houses, the way in which milk and bread are likely to be productive of disease, are dwelt upon with details which make the picture truly disgusting, and show what a great deal of work there is to be done in cleansing away the foulness, and so improving the public health of Calcutta, that, as the author says, it will no more be dreaded as "the home of cholera."

In the recently published Proceedings of the Scientific Meetings of the Zoological Society, Mr. H. H. Johnston gives a short account of some of the fauna observed in the Kilima-njaro Expedition, which is followed by more detailed papers. He was obliged, by the difficulty of getting assistance, to do most of his collecting and preservation of specimens himself. Baboons he found rather abundant and very bold, as they are but little molested by the natives. The leopard is more feared by the natives than the lion. The zebra (*Equus chapmani*) is said to be found in incredible numbers in the plains round Kilima-njaro; the ostrich is also abundant, but it never produces fine plumes.

From a recent report signed by Mr. Henry Trimen, M.B., it appears that the area devoted to the

cultivation of coffee in Ceylon is steadily decreasing, and that in several districts it bids fair to be wholly superseded by tea before long.

THE Distribution of Power is the subject of an article in "The Machinery Market" for October, from which it appears that the system of conveying power from a central station by means of hydraulic pressure is already carried on to some extent in London, while preparations are being made in Birmingham for its conveyance by means of compressed air. By these means the necessity for separate engines, boilers, &c., will be lessened, with the attendant advantage of a diminution of smoke. It is thought that while large factories cannot be expected to come successfully within the sphere of these plans, yet that for driving warehouse cranes, lifts, electric lights, working dock-gates, coffee-mills, and many small machines, particularly where the power is required intermittently, they may, if the charges are reasonable, offer great advantages.

"ENGINEERING" says that a proposal is on foot to join the rivers Volga and Don by a canal. The two rivers come within 50 miles of one another, and the idea of a canal to unite them was thought of by Peter the Great. The river Volga is, by encroaching on its western bank, gradually approaching the Don.

A NEW kind of life-saving dress has been tried with success in the Thames, where several persons wearing the material, jumped into the water and were supported by it. The distinctive feature of the substance consists in the use of fine threads of cork interwoven with the other fibres. The new idea has been brought out by Mr. W. Jackson, of Pimlico.

IT has been decided to hold a pocket-box exhibition of entomological specimens in connection with the Haggerston Entomological Society, at 10 Brownlow Street, Dalston, London, E., on November 12th. The kind co-operation of Entomologists on the occasion is solicited. The Secretary is Mr. Ernest Anderson.

THE Sydenham and Forest Hill Microscopical and Natural History Club opened their session, with an exhibition of microscopes and natural history objects at the Foresters' Hall, Forest Hill, on Thursday, October 1st. There was a good show of microscopes and curiosities, and a large number availed themselves of the invitation of the Club. During the evening ten applications for membership were received by the Secretary. Further new members are much wanted, and any lady or gentleman desirous of joining may obtain information about the club from the honorary secretary, Mr. A. C. Perrins, 12 Sunderland Villas, Forest Hill, S.E.

IN a recent number of the "Engineer" is an article, illustrated with map and other figures, describing the preparations for the explosion of the Hell Gate Rock in New York Harbour. The rock was a ledge of gneiss, in the form of a very irregular obtuse cone, only a small portion appearing above the water. The work of removing it was begun in 1875, and since then galleries had been bored into it to an aggregate length of over 21,000 feet, and about 45,000 cartridges placed in position. The explosives used consisted of about eight volumes of rackarock to one of dynamite No. 1. The former substance is a mixture of chlorate of potash with dinitro-benzole, having the appearance of a moist, light-brown sugar. The explosion was effected by electricity, and took place successfully on the 10th of last month. The intention was to give a channel of the clear depth of 26 feet.

ERYTHROXYLON COCA is now said to have been successfully employed as a remedy against, and a cure for, sea-sickness.

MICROSCOPY.

STARCH IN LEAVES.—An easy method of shewing starch granules *in situ* is given, in the "American Monthly Microscopical Journal," as having been recently described by Sachs. The fresh leaf should be placed in boiling water for ten minutes, after which the chlorophyll should be extracted by placing it in alcohol. The cells of the leaf are thus rendered colourless, and are not broken. The starch inside them can then be shewn by means of iodine. Comparative experiments can be made by exposing part of the leaf to the sun, while the rest is protected; and it is said that a leaf gathered in the evening shows more starch than one gathered in the morning.

JOURNAL OF THE QUEKETT MICROSCOPICAL CLUB.—The October number contains a Presidential Address delivered by Dr. Carpenter last July. Speaking of the question of the specific differences of bacilli and the diseases they are supposed to cause, Dr. Carpenter said that he had always held the view of the very wide range of species, especially among the lower types of animal and vegetable life. He believed that the manifestation of disease germs may be extraordinarily affected by the condition of the body in which they fructify, and that a large range of forms of disease may be produced by the same infection; the bacteria, when cultivated, as it were, in the human body, giving rise to one or another form of disease according to circumstances. Dr. Carpenter also spoke of a paper recently published by Mr. Waddington on the subject of nitrification in the soil. Although Mr. Waddington had not been able to discover the organism microscopically, his conclusion was that the action was due to some protophyte, a conclusion on which Dr. Carpenter thought very little doubt was entertained by some good chemical authorities to whom he had spoken on the subject.

THE JOURNAL OF MICROSCOPY.—Besides the paper on How Plants Grow, referred to in another column, the October number of this journal contains a paper by V. A. Latham, F.M.S., on Practical Histology, being Part IV. of "The Microscope and How to Use It;" a second lecture on "Pond Life," by Mr. W. E. Hoyle, M.A.; "Half an Hour at the Microscope with Mr. Tuffen West;" Selected Notes from the Society's Note-Books, &c. At the end are six lithographic plates, which in this number are to a large extent entomological.

TESTING OBJECTIVES.—In a note on this subject in "The American Monthly Microscopical Journal," the process of testing lenses by means of various "test" objects is considered to smack somewhat of charlatanism, though the use of a good Podura scale is recommended. "The fact is, as every practical observer well knows, the best test for a working objective is to use it in regular work for some time."

COLLINS'S "SPECIAL" MICRO-SLIDES.—Mr. Charles Collins's Catalogue of his "special" slides for the present season is to hand, and with it half-a-dozen sample slides, selected from different series, as follows: From series No. 4 (Heads of Insects) the head of the water boatman; series No. 6 (the Silk-worm and Moth of ditto), the trachea and spiracle (*in situ*) of the caterpillar; series No. 7 (Anatomy of Blow-fly), the buzzing organ; series No. 8 (Anatomy of Honey-Bee), the wings, showing hooklets; series No. 9 (Anatomy of the Great Water-Beetle), the trophi; and from series No. 10 (Anatomy of the Oil-Beetle), he sends the antennæ. These slides ought to be of great service to those who cannot provide the objects for themselves.

ZOOLOGY.

ARION ATER.—Besides the varieties of this slug described in the June number, a few others have been described as inhabiting foreign countries. One of the most remarkable is var. *Mülleri*, black with a pale greenish keel. Var. *Draparnaudi* of Moquin-Tandon, dull red, with a yellowish or reddish foot-fringe, is scarcely distinct from var. *rufa*. I have found it at Croydon, and 17 specimens of *A. ater* collected at Bromley, Kent, were in the following proportion: type 2, *nigrescens* 2, *rufa* 10, and *Draparnaudi* 3. Moquin-Tandon also mentions var. *rubra*, red, and var. *virescens* greenish with yellowish-orange lateral bands. Not long ago I found at Chislehurst two examples of the variety *rufa* busily engaged in devouring the remains of a specimen of *Helix hortensis*, var. *lutea* 12345, and a *Limax maximus* which had been accidentally crushed, thus affording a good illustration of the carnivorous propensities of this slug. Query, does it ever attack living snails or slugs?—*T. D. A. Cockerell, Bedford Park, June* 30.

MOSQUITOES KILLING TROUT.—In a very interesting letter which appears in "Science," in advance of its publication by the U. S. Fish Commission, Mr. C. H. Murray, of Denver, describes how in 1882, when he was at the head-waters of the Tumiche Creek in the Gunnison Valley, Col., he watched for over half-an-hour the ways of trout and mosquitoes. Very young trout kept coming up to the surface of the water, possibly for more air, so that the top of their head was on a level with the surface. When this occurred, a mosquito, of which a swarm was flying above, would alight upon the trout's head, insert his proboscis into its brain and suck away till he had extracted all the life juices, after which he would fly away, and the dead trout turn on his back and float down the stream. Mr. Murray thinks that great numbers of trout, and perhaps other infant fish in clear water, must come to their death in this way.

THE AXOLOTL.—It appears that Miss Marie von Chauvin, in continuing her researches on the development of the Mexican Axolotl into the Amblystoma, has succeeded in some instances in accelerating, retarding, and reversing the metamorphosis, so that the axolotl may be made to pass on into the condition of a lung breathing animal, to remain for a time in a state of suspended metamorphosis, or even to revert to the axolotl stage once more.

A SWARM OF CRABS.—A very interesting occurrence has been reported from the island of Cuba, which reminds one of the "showers of frogs" occasionally heard of, namely the appearance of enormous quantities of small crabs. The keeper of a lighthouse at the western end of the island says that they came in floating patches of a reddish colour from a south-west direction. They formed heaps upon the shore, which they approached mostly during the night. They appeared on four occasions last spring, "they invaded the houses and the yards, and the tower of the lighthouse up to a certain height, so that we had to brush them away with brooms and shovels, and finally to close the doors and windows, and cover the openings of the water-tanks with canvas and sacking."

THE SUN-FISH.—It appears that the sun-fish which has comparatively small pectoral fins, uses them only as balancers in swimming, and progresses almost exclusively by means of the dorsal and anal fins which are large, about the same size, and placed in the same vertical line. In a letter to "Science" by Mr. John A. Ryder, it is said that the fish moves the dorsal and anal fins synchronously from side to side, twisting them at the beginning of each stroke into the form of a screw propeller blade; the great expanse of the body gives the fish stability. Its slightly developed tail it uses as a rudder, by which, however, it cannot turn very quickly.

BOTANY.

Ozone given off by Plants.—Investigations which may have a decidedly practical tendency have been made by Drs. J. M. Anders and G. B. M. Miller on the production of ozone by plants. Their experiments, which were made by way of testing results which had been obtained before, lead them to the following conclusions. First, that both odorous and inodorous flowering plants generate ozone, but the former the much more actively that, so far as tested, scented foliage, especially pine and hemlock, produces it; and finally that a necessary condition apparently is the presence of the sun's rays, or at least a good diffused light. It is evident that the power thus shown to be possessed by plants is an important factor in deciding the question of their cultivation indoors, though it does not follow that the net results are beneficial. As to the pine, the authors conclude their paper (which may be found in the "American Naturalist" for September), by saying that "since the exhalations from the pine foliage are active agents in generating ozone, it follows that all of the important hygienic advantages of ozone are to be derived, to a marked degree, from the presence of pine woods."

The Botanical Exchange Club.—Two Reports of this Club are to hand, those for 1883 and 1884. The latter shows an increase by some hundreds, in the number of plants received for distribution, over the previous year. The greater part of the Reports consists of notices of plants, naturally with somewhat unfamiliar names, with observations appended, presumably those of authorities to whom the plants were forwarded for identification.

How Plants Grow.—The first paper in the "Journal of Microscopy" for October is one with the above title, by Mr. H. W. S. Worsley-Benison, F.L.S. The paper may be taken as a sequel or continuation of the one on "What is a Plant?" and in it the author touches in succession upon the vegetable cell as an individual, the cell in combination, cell formation and growth, and the reproductive processes—fertilisation, embryonic growth, and germination—to show the origin of the primary cell. The methods of feeding, moving, climbing, and reproducing are, he says, worthy of a separate paper, and are, for the most part, passed over here.

"The British Moss Flora."—The ninth part of Dr. Braithwaite's important work on "British Mosses" is now out, and bears date of September. It contains the second part of Fam. VIII., Tortulaceæ, and consists of the usual letterpress and four plates full of figures. This work is published by the author, at 303, Clapham Road, London.

The Common Sunflower.—The flowers are proterandrous, although the stigmas emerge at the same time that the pollen is shed, but the stigma-lobes do not separate and curl back until after the pollen has been distributed or lost its virtue. Briefly, the process seems to be thus: The stigma, with its lobes closely appressed, is thrust through the tube formed by the synandrous stamens. The stigma-lobes are papillose on their outer surface, and the dehiscence of the anthers is introrse. Consequently the pollen is forced upward by the ascending stigma, aided by the papillæ on the latter, and, as the anthers are then very prominent, insects readily come in contact with the pollen. Afterwards the stigmas become more projected, separate, and, in curling back, force down the anther tube into the corolla. I do not think either shrinkage or bees have anything to do with the depression of the stamens. The object of forcing back the stamens seems to be that of getting the stigmas in the same relative level as the anthers had been. Mr. Swan said nothing about the copious secretion of viscid saccharine matter on the unopened buds in the centre of the head. Upon this the bees sometimes alight, and may be seen busily feeding. They then resort to the flowers, working from the centre to the circumference, and in doing so convey pollen from the inner florets to the projected stigmas of the outer ones, but I fail to perceive in this any special arrangement to secure cross-fertilisation between different capitula. If the insect worked from circumference to centre (and, seeing that the ray-flowers are the most attractive, one would think that this were the case), the adaptation to secure cross-fertilisation would indeed be perfect; but I have been informed, on good authority, that the bee generally works from centre to circumference, which process would simply secure cross-fertilisation between the inner and outer whorls of florets on the same head. My own observations upon numerous plants in my garden do not satisfy me that bees have a preference for one mode above the other, but that they alight without much discrimination, and commence operations at the nearest accessible point. Mr. Swan's theory, that stamens and pistil are developed spines, does not appear probable. Considering the normal number of the parts, their consistency with the arrangement in other compositæ, and the evidence afforded generally by analogy, it is unlikely that in sunflowers the stamens and pistil are developed spines, unless Mr. Swan means to say that in the compositæ generally, the parts are thus developed. If, however, they are, to what organs do these spines belong? In the sunflower, their object is evidently to prevent the depredation of insects. The immunity of sunflower leaves from insect attacks has often been noticed, and Kerner supposes that they contain juices or secretions distasteful to the insects. In my opinion, the stiff bristles on the stem, branches, and leaves are quite sufficient to account for their freedom from insects. In my garden, plants with glabrous leaves were literally beset this summer with aphides, but not one could be seen upon the

sunflower. Of course the function of the bristles on the floral organs is to prevent insects from creeping into the head from below, and thus, by getting between the achenes, to get at the nectar cups by an illicit process.—*J. Hamson, Bedford:*

GEOLOGY.

RECENT PROGRESS IN GEOLOGY.—From an abstract in "Science" of the address delivered at the recent meeting of the American Association by Professor Edward Orton, it appears "the oldest living type of vertebrates" is to be found in a shark recently described by Mr. Samuel Garman. This fish proves to be a cladodont, and is closely allied to the genus Cladodus of carboniferous time, a genus hitherto supposed to be long ago extinct. Professor Claypole discovered spines and scales of fish in the iron sandstone of the middle Clinton group of central Pennsylvania, and his *Onchus clintoni* must at present, says Professor Orton, enjoy the distinction of being the earliest known representative of vertebrate life on the globe, while the first of the inhabitants of the dry land is the cockroach (*Blatta*), of which the fragment of a wing was found in middle silurian strata in central France.

PROCEEDINGS OF THE LIVERPOOL GEOLOGICAL SOCIETY.—After the annual address by the President, Mr. T. Mellard Reade, which has already been noticed in this volume (p. 213) comes a paper by Dr. Herdman on the Conservative Action of Animals in Relation to Dynamical Geology. The author draws attention to the protection afforded by certain animals to the rocks of the sea-shore; and instances the common acorn shell, sponges, ascidians and polyzoa, and a species of annelid (Sabellaria), all of which may in some way form, by their manner of growth, a covering to the rock, thus hindering its denudation. He concludes with a list of the different groups of animals which he believes to have similar effects. The other papers published in the same number are on the Microscopic Character of the Triassic Sandstones of the country around Liverpool, by G. H. Morton; on a Quarry at Poulton, by H. C. Beasley; The Mersey Tunnel, its Geological Aspects and Results, and two other local papers, by the President.

FOSSIL SLUGS.—In a letter to "The Geological Magazine," Mr. J. Starkie Gardiner says Testacella is recorded from the Middle and Upper Miocene and Pliocene, Limax from the Lower Miocene and upwards, Amalia from Upper Miocene, Parmacellina from Upper Eocene, and *Arion ater* from Pleistocene. Vitrina, Succinea, and Hyalinia, scarcely "slugs"—a rather vague term—are found fossil in the Tertiaries. "Probably many other slugs are known as fossils in America, but it is of course only genera provided with some sort of shell that can possibly leave behind any fossil remains."

NOTES AND QUERIES.

TREES STRUCK BY LIGHTNING.—In the storm of August 13th, which was felt severely in the neighbourhood of Richmond, Surrey, an oak-tree was struck by the lightning near to the White House, the residence of the Duke of Teck, which presented a terrible illustration of one of the forces of Nature. The tree was a fine old specimen, forming one of a noble family, which must have counted very many years in its leafy life, and was full of vigour and vitality when the electric fluid struck it; a fellow tree, standing only a few yards off, would appear to have received the first blow, which, falling on to the topmost branch, split its trunk from the top to the bottom, peeling off the bark, and making a clean cut right down to the earth; thence it would appear as if it bounded on to the neighbouring oak which it shivered into fragments, beginning apparently at the base, as one states who was driving past, that he observed some of the branches tossed upwards into the air, and this statement is supported by the fact, that the writer noticed portions of disintegrated boughs hanging on, and upon other trees at some distance from the one upon which the heaviest blow fell. So powerful was the force employed that the fated tree, which stood about ninety-five yards from the duke's garden, had some of its parts scattered in it, while the ground, for many yards around the base of the tree, was covered with the ruins; and the tree, completely stripped of its bark, was, in the most extraordinary manner, reduced to ribands, the solid wood being resolved into fibre, as easy of division as the strands which compose a rope's end. So perfectly was the bark removed from the main trunk, that it was perfectly free from all splinters, and as smooth as though it had been removed by careful hands, while the upper portion which remained stood pointing towards the sky with whitened and significant fingers in the direction of the expended force. A number of persons visited the ruins, many of whom took away specimens of the disintegrated fibre as affording a very remarkable illustration of the force of the electric fluid.—*J. Crowther.*

NESTING OF MOUNTAIN LINNET.—It may be worth recording in your journal the fact, that a pair of mountain linnets have this summer nested on Blackstairs, a well-known mountain in this vicinity, and successfully reared a brood of young birds, now about ready to fly. No nest of the species has, I believe, been heretofore discovered in the south of Ireland, and certainly its breeding in these latitudes is a very unusual event. The nest is built in a low clump of heather and stunted furze, on the edge of a pretty grassy ravine through which a stream trickles, and is composed chiefly of dry bents, with a lining of the wool of mountain sheep. The fearless demeanour of the parent birds is exceedingly interesting. On the 8th of August, my brother and I first disturbed the male bird from the banks of the stream near which his nest is situated. Instead of flying to any distance, he sought refuge and concealment a few yards away by lighting against the bare perpendicular bank of the ravine, which, being of a damp gravelly composition, harmonised so exactly with the dark brown hue of the bird's plumage, that, even after seeing him light upon it, we had no little difficulty in distinguishing his figure from the sombre background. We several times dislodged him from this situation, but he invariably took up a similar one a little farther down, and would peck contentedly at the gravel

while we stood within six feet of him; even after momentarily casting the eye aside, it was by no means an easy matter at this short distance to detect him again, though the bank was perfectly bare of herbage. After watching him long enough for our satisfaction, we passed him without difficulty. On that occasion I never thought of looking for a nest. However, on the 22nd of the month, while strolling up the same ravine, I heard what seemed to be the voice of a linnet quite close by, and, thinking at once of my friend the twite, lay down quietly on the sward to take a survey. Nothing in the shape of a bird was visible, though I gazed scarchingly at the dark walls and pebbly stream-bed, with its narrow margins beautifully sprinkled over with bells of the delicate little *Wahlenbergia hederacea*, and I had just abandoned the quest, and stood up to continue my mountain walk, when up flew a pair of twites from the edge of the ravine immediately beside me. This was somewhat tantalising. But, as they only flew to the top of the bank, I again lay down, and in a few minutes their confidence was perfectly restored, both birds returning to the brink of the stream and picking about among the gravel with quite a surprising unconcernedness. Still more was I surprised when the hen bird suddenly popped into a clump of heather, and was greeted within by a chorus of shrill eager little voices. Upon her exit I, of course, went and peeped at the nest thus unexpectedly revealed, which contained three yellow-beaked youngsters. At this conduct of mine, the old birds manifested, no doubt, some little degree of anxiety, hovering round with plaintive calls of "twa-eet, twa-eet;" nevertheless, as their solicitude did not seem to be of a very frantic nature, I made the experiment of lying down again, this time on the top of the bank, immediately beside the nest. In a very few seconds the two little birds were quite at ease once more, and resumed their pecking among the gravel; what manner of edible materials they were collecting I did not succeed in making out, but it was not long before the mother paid another visit to the nest, notwithstanding the fact that my head was now within some twenty inches of that precious edifice. It may be that mountain linnets have peculiarly short memories; at all events, no birds could possibly have conducted themselves with a more total disregard of a spectator's presence. After repeated visits to the nest, the birds went down to the stream together and enjoyed a good splash in the waters; and, having thus refreshed themselves, with many notes expressive of extreme self-gratulation and contentment, the little couple flew off down the ravine, and were soon lost to sight. Finding myself thus left apparently sole guardian of the home and family, I followed the parental example, and at once took my departure.—*C. B. Moffat*, *Ballyhyland, co. Wexford.*

Epping Forest.—It may be interesting to some of the readers of Science-Gossip to know that during the past few months the beautiful floscule, *Stephanoceros Eichornii*, *Plumatella repens*, *Volvox globator*, *Melicerta ringens*, and many other infusoria have been pretty abundant in the ponds of Epping Forest between Forest House, Leytonstone, and Woodford.—*A. P. Wire, Harrow Green.*

"Is the Water-Ouzel an Enemy to Fish?"—I may say that in my observations of this most interesting bird, I have come to the conclusion that small fish do form a part of its diet, but only a small part, the only fish that I have known it to kill being the minnow and roach, and these only very seldom, its principal food consisting of water screws, larvæ of May-day flies, and such insects as frequent the beds of small stony streams. I have never known it in any instance to eat the spawn of fish. I should like, if any correspondent could give me a list of the "worst enemies to fish spawn," that the water-ouzel is said to devour. The worst enemies to fish spawn that I know of are "gudgeon and eels," neither of which to my knowledge the water-ouzel destroys. With reference to the berry-eating capacity of the water-ouzel, I have never found it to feed on berries or seeds of any description, and I fail to see how our bitterest winters can at all affect its diet; water insects are as plentiful in winter as in the summer time—far more plentiful I should say, than the fruit of the cuckoo pint. It is a scarcity, I should say, of earthworms and slugs, in winter, which causes birds of the thrush family to depend so much on berries for their sustenance. The comparative scarcity of this interesting bird (the water-ouzel) is much to be deplored, and if this is due to the supposition (as I suppose it is) that it destroys a number of useful fish, I think with your correspondent that we should do as much as we can to put this supposition to naught. I find that it is principally gamekeepers, and people who regard any bird, beast, or reptile, that does not claim to come under the designation "game," as vermin, and therefore to be destroyed at every opportunity—it is those who set down the water-ouzel as an enemy to the fish, and destroy it at every opportunity.—*J. Bowman.*

The Lesser Shrew in Staffordshire.—Fauna of Staffordshire.—I send a note of what I believe to be the first recorded instance of the occurrence of the smallest of our British mammals, the lesser shrew (*Sorex pygmæus*) in Staffordshire. The little creature was found dead (doubtless a victim to the mysterious autumnal mortality peculiar to the shrew family) by Mr. Ernest W. H. Blagg on Tuesday, 8th of September, near Consall Hall, in this county. If any of your readers can furnish me with well-authenticated instances of the occurrence of any of our rarer British quadrupeds or birds in Staffordshire, I shall feel much obliged.—*John R. B. Masefield.*

Lesser Dodder.—When I went for my holidays in last August to the Ashdown Forest, Sussex, I found the lesser dodder (*Cuscuta epithymum*) in great quantities. I found it on fifteen different varieties of plants, among others oak, hawthorn, agrimony, gorse, needlewhin, heath, ling, wax-heath, blechnum fern, both on fertile and barren fronds and bracken. It was very plentiful on gorse, heath, and ling, but not so much so on the others. In general the flowers were pinkish, hanging in little round bunches on deep purple stems, but I also observed some with pure white flowers attached to pale green stems, they did not grow in such full clusters as the purple ones did. The green plant was not in a more sheltered situation than the purple. Will somebody kindly inform me whether it is a different species, or only a variety?—*Ethel Webb.*

Danais Archippus in Cornwall.—I have to record the occurrence of this splendid North American butterfly (*Danais Archippus*) at the Lizard this year. No less than three specimens have been captured by Mr. Alfred H. Jenkin, of Redruth, all within a few days; the first being taken on the 17th of September last. A fourth specimen has been seen. All are in fine condition, and there can be little doubt about their having been bred in West Cornwall. I may add that the same gentleman had the good fortune to find last year, also at the Lizard, a specimen of the very rare beetle *Emus hirtus*.—*E. D. Marquand, Penzance.*

Chærocampa Celerio (the Silver-Striped Hawk-Moth) at Leicester.—It may interest some of the readers of Science-Gossip to know that a specimen of the above rarity was brought to me alive on September 30th, having been taken in a house in Guildford Street the Sunday previous. Owing to rough handling, the specimen was somewhat rubbed, but is otherwise in good condition. It is now in my collection.—*F. R. Rowley*, *Sub-Curator*, *Museum*, *Leicester*.

A Suggestion for Scientific Societies.—I have no doubt but that many of the secretaries of the numerous scientific societies, which have recently sprung up in this country, have, like myself, found how difficult it is to provide papers to be read at their meetings. The society to which I am hon. secretary has been started for about three years, and hitherto we have been fairly successful, but it is impossible that the few members who have come forward and have read papers, can be expected to continue to do so. It has struck me therefore, that it would be an excellent plan, if members of scientific clubs would read, or even lend, their papers, to other societies. If you agree to the practicability of this suggestion, perhaps you will kindly open your columns to some further correspondence on this subject, with the view of promoting some such arrangement being carried out.—*An Hon. Sec.*

Seeds of Solanum dulcamara.—A foreign correspondent, C. C., writes to the effect that in Orfila's capital tract, *Toxicologie générale*, it is said that a cock suffered no inconvenience after having swallowed seeds of *S. dulcamara*.

Sagittaria sagittifolia.—With reference to notes in this and preceding vol. of Science-Gossip, the same correspondent remarks that Casparus Bauhinus, in his *Prodromo theatri botanici* describes very accurately an unknown *gramen bulbosum aquaticum*, and gives a recognisable figure of the bulb of the Sagittaria. Casparus Bauhinus seems to think, however, that the bulb is the origin of the leaves, while it is the nutritive reserve for the next year, and a mode of propagation.

Birds and Ants.—The same correspondent, referring to Mr. Mattieu Williams' remarks on p. 222, says that he has, during the past spring, gathered many nests of ants, and given the larvæ and the adult ants to some caged nightingales. These ate the ants with such eagerness that none could escape their notice, and the birds showed great impatience to get at the ant box.

Crocus nudiflorus.—This flower is, I believe, rarely if ever, found in the north of England. Bentham, in his "British Flora" says, "It does not grow nearer to us than south-western France, though it is said to be perfectly naturalised in the meadows about Nottingham, and in some other localities in central England." There is now (October 7th), or was, some twelve or fourteen days ago, a considerable quantity of these bulbs in flower in a field on the outskirts of Rochdale. As far as I can tell, these have never been seen to flower before, or, at least, not for some years past. It is therefore, I think, a fact, quite worth the notice of the readers of Science-Gossip. This flower is easily distinguished from the *Colchicum autumnale*, by its bearing three, instead of six, stamens, and from the *Crocus vernus* by the flowers being rather larger, and only flowering in the autumn. I should be glad to know if any of the Science-Gossip readers have ever seen or heard of it still further north?—*Jane Fishwick.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

To Anonymous Querists.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

We request that all exchanges may be signed with name (or initials) and full address at the end.

H. L.—Answer next month.

H. W. Case.—Your exchange unsuitable in form as sent. Inserted as altered.

J. J. A.—For all information about Dr. Braithwaite's "British Moss Flora," apply to the author, 303 Clapham Road, London.

Dr. A. C. Stokes.—Received with thanks.

G. S.—Write to Mr. E. T. Draper, 8 Harringey Park, Crouch End, London, N.

C. C.—An answer probably next month.

George Rees.—Thanks for your note and sketch. Refer to Dr. Maxwell Masters' "Vegetable Teratology," if you have access to it. It is probable you will find some figure or description therein *à propos*.

Fred Chall's.—The question of the fluidity of the interior of the earth would not be set at rest by the sinking of a shaft into molten lava.

A. P.—The plant seems to be certainly *Erica tetralix*, or cross-leaved heath. At the same time, the leaves are not very definitely in fours.

F. J. R.—Hewitson gives coloured illustrations of the eggs of apparently all the birds he names in his two volumes.

R. M. and another.—Exchanges apparently anonymous.

J. Forbes.—Dr. Pereira's "Materia Medica" and "Therapeutics" (Longmans); Royle's "Manual of Therapeutics" (Churchill); "The British Pharmacopœia" (Spottiswoode & Co.). One of these might suit you. If you could get a sight of the Library of the Pharmaceutical Society in Bloomsbury Square, London, you might get further hints.

EXCHANGES.

Wanted, "Rust, Smut, Mildew, and Mould," by Cooke; also "Pond Life," by Slack. Will give in exchange well-mounted slides of insects, &c.—J. Boggust, Alton, Hants.

Parts up to press, Braithwaite's "British Moss Flora," magnificent plates, clean and uncut, for corals, eggs, crustacea, or other objects.—James Ellison, Steeton, Leeds.

Wanted, good micro slides or small telescope in exchange for my large glass cylinder for electrical machine.—Cook, Morton Buildings, Blackburn.

Cassell's "European Butterflies and Moths," Nos. 1 to 16 inclusive, and several numbers of "The Entomologist" for exchange: wanted, micro slides, chiefly botanical.—H. W. Birney, Mayville, New Park Road, Bedford.

A tube of *Volvox globator* will be exchanged for well-mounted slide, diatoms preferred.—F. Shrivell, Hadlow, Kent.

Wanted, Hobkirk's "British Mosses" and volumes of Science-Gossip, bound or unbound, from 1868 to 1875 inclusive. Will give good micro slides in exchange.—Samuel M. Malcolmson, M.D., 55 Great Victoria Street, Belfast.

Exotic butterflies: rare species of Papilio much wanted for figuring for a monograph of the genus; need not be fine. Many duplicates of such and others for exchange, also wings of brilliant species.—Hudson, Railway Terrace, Cross Lane, Manchester.

Offers requested for "Knowledge," up to date, 7 vols., and "Illustrated Science Monthly," vols. 1 and 2.—J. Humphrey, 253 Glossop Road, Sheffield.

Wanted, the following parts of the "Monthly Microscopical Journal," parts 1 to 7, 13, 17, 19 to 31, 33 to 39, and 55 to 73, will give good micro slides in exchange, or unmounted sections if preferred.—J. J. Andrew, 2 Belgravia, Belfast.

Wanted, from beginning to end of 1872, Science-Gossip; good micro slides and pendulograph writings in exchange.—J. J. Andrew, 2 Belgravia, Belfast.

Aquarium, 17 × 7½ × 10 in., inside measure, fitted with rockwork, fountain, waste-pipe, &c., slate bed, plate-glass front; also Camden's "Britannia, 1695," numerous maps and plates, and "Half Hours in the Green Lanes;" exchange one or all for micro accessories or "Familiar Wild Flowers." Metronome by Maëlzel, mahogany case with bell; will exchange for con-

densor or micro slide mounting materials.—William E. Daw, jun., West Winch, King's Lynn.

SEVERAL foreign books, mostly German, including one on natural history. Lists sent on application. Also a pair of ivory gilt opera glasses by Pillischer, in exchange for natural history books or offers. Unaccepted offers not answered.—F. H. Parrott, Walton House, Aylesbury.

WILL exchange books: Buckmaster's "Elementary Chemistry" and Jarmain's "Qualitative Analysis," also, the "A. B. C." water-testing apparatus (very interesting), for slides of well-mounted algæ, zoophytes, polycistina, diatoms, or bacteria.—H. W. Case, Oxford Street, Cotham, Bristol.

DUPLICATE microscopic slides of various sorts, and Lepidoptera to exchange for other slides—algæ, and fossil woods or other rocks.—A. Wells, Dalmain Road, Forest Hill.

DUPLICATES of dried plants, L. C., 7th edit., Nos. 7, 9, xi, 26, 40, 41, 273, 273*c*, 274, 275, 305, 325, 350, 372, 374, 564, 568, 572, 574, 576, 577, 581, 587, 591, 594, 595, 813, 816, 821, 823, 831, 835, 838, 856, 858, 875, 914, 998, 999, 1007, 1008, 1039, 1040, 1261, 1264, 1265, 1276, 1277, 1280, 1282, 1285, 1294, 1296, 1297, 1305, 1314, 1325, 1326, 1327, 1330, 1333, &c.—H. Goss, Berrylands, Surbiton Hill, Surrey.

To American diatomists: American gatherings or deposits desired in exchange for pieces of the well-known "Cementstein" from Mors, Jutland. Send list in first instance.—H. Morland, Cranford, near Hounslow.

OFFERED, L. C., 7th edit., 48*b*, 49, 360, 384, 455, 1024, 1041, 1106, 1187, 1188, 1240, 1417, *Carex flava, minor*, &c. Wanted, 363, 370, 404, 1050, and many others. Lists exchanged.—Dr. A. Davidson, Sauquhar, N.B.

DAVUS, Artaxerxes, Dicteæ, fuliginosa, bidentata, interrogationis, and many other northern species, in fine condition and well set. Wanted, fresh-killed specimens of barn owl, kingfisher, and local specimens, &c.—J. Mundie, 22 Watson Street, Aberdeen, N.B.

DUPLICATES.—Bulbs: *Narcissus bicolor, major, Macleai, orientalis, pseudo-narcissus* fl. pl., *poeticus, ornatus, Bulbocodium, triandrus*, &c., *Lilium Californicum, Chalcedonicum, eximium, Gladiolus Byzantinus*, G., *Colvillei alba, Cyclobothra pulchella, Allium Neapolitanum, Iris reticulata, Anemone fulgens, Hemerocallis flava*, &c. Wanted in exchange, other choice bulbs, &c., British and foreign Lepidoptera, rare British and foreign shells, scientific (especially botanical) books; all offers invited and replied to.—J. T. R., Spring Cottage, Dee Banks, Chester.

LIVING specimens of *Limnias ceratophylli* offered in exchange for well-mounted slides, selected diatoms preferred.—G. A. Barker, 1 Northwold Road, Upper Clapton, E.

SCOTCH Alpine and sub-Alpine mosses and hepaticæ for south of England species, especially from chalk and limestone.—William Smith, Addison Place, Arbroath, N.B.

WANTED, Roscoe and Schorlemmer's "Chemistry" and Dana's "Mineralogy," latest editions. Will exchange Beale's "How to Work with the Micro," and other good books.—F. C. King, 2 Clarendon Street, Preston, Lancashire.

"MINING JOURNAL," complete, clean, unbound, 8 vols., 1876 to 1883 inclusive; exchange for "Micrographical Dictionary" and Lyell's "Principles of Geology," or offers; books, &c., microscopical and geological preferred.—J. Barron, Wakefield.

OFFERED, twenty-four packets of microscopic material in exchange for three good slides or other material.—W. Sim, Gourdas Fyvie, N.B.

ZOOPHYTES and Polyzoas in exchange for others.—J. Smith, jun., 63 Legh Street, Warrington.

WANTED, a copy of Johnson's "British Zoophytes;" state wants.—J. Smith, jun., 63 Legh Street, Warrington.

Wanted, good micro slides; skins and mounted specimens of mammals and birds, and other objects, offered in exchange.—F. R. Rowley, 60 Lower Hastings Street, Southfields, Leicester.

SUBSCRIBER'S edition of Cassell's "History of the United States," by Edmund Ollier, 3 vols., complete, unbound, profusely illustrated with wood engravings and 30 steel plates; exchange for Geikie's or other good "Geology."—H. P. Dodridge, 7 Wharton Street, W.C.

OFFERS requested for "Midland Naturalist," complete series, up to end of 1885.—F. G. S., 2 The Polygon, Clifton, Bristol.

WANTED, binocular microscope with rotating stage in exchange for monocular. Full particulars to—J. B., Gillsburn, Kilmarnock, N.B.

MICROSCOPE by Steward, Strand; capital instrument, with ½ in. objective, polariscope, condenser, and mahogany case, all in thorough condition; will exchange for another secondhand, large size, with latest improvements.—H. W. Case, Cotham, Bristol.

WHAT offers for "Hopkinson on the Indicator" and SCIENCE-GOSSIP for 1880?—Archibald W. Fry, Bridge House, Arundel.

WANTED, British wild bees (fresh specimens only), must be correctly named. Good exchange given in micro slides.—C. Collins, Bristol House, Harlesden, N.W.

SIDE-BLOWN eggs of willow wren, marsh tit, pied wagtail, yellow wagtail, ringdove, hooded crow, mallard duck, coot, Arctic tern, black-headed gull, guillemot, and others; wanted, other eggs in exchange.—A. Kelly, 5 Canal Lane, Aberdeen.

A GREAT number of duplicate Coleoptera and Lepidoptera, all well-set and in good condition, to exchange for birds' eggs or skins, works on oology, or books of sport. Send for lists to—W. P. Ellis, Enfield Chase, Middlesex, N.

BRITISH and American birds' skins in exchange for magic lantern slides or offers.—James Ingleby, Eavestone, Ripon.

FOSSILS from the shell bed in the millstone grit for fossils from the red crag or others.—James Ingleby, Eavestone, Ripon.

FRESHLY-COLLECTED marine sponges, zoophytes, anemones, &c., offered in exchange for shells, eggs, or other natural history specimens. Offers requested.—C. Jefferys, Tenby.

HUMMING-BIRDS' skins, in good condition; what offers? SCIENCE-GOSSIP for 1884, in numbers, clean.—Joseph Anderson, jun., Acre Villa, Chichester, Sussex.

A GOOD exchange offered for following nests containing clutch of eggs, with data: pied flycatcher, nightingale, stonechat, marsh warbler, Dartford warbler, woodwarbler, great tit, rock pipit, woodlark, cirl bunting, hawfinch, goldfinch; also wanted, foreign species, nests with eggs.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

WILL send three *Hydra fusca* in tube, or two young newts with external gills showing circulation of blood, in exchange for well-mounted slide, stained biological preferred.—Mr. Swainson, Gilnow Park, Bolton.

EXCHANGE *Helix visana, Helix obvoluta, Bulimus acutus*, and var. *bizona, Bulimus montanus, Clausilia laminata*, var. *albida*; for *Limnæa involuta, Succinia oblonga, Acme lineata*.—J. Madison, 167 Bradford Street, Birmingham.

WILL give *Cyclas ovalis, Paludina Listerii*, for *Alismadon margaritifera, Unio tumidus, Unio pictorum*.—G. C., 68 Rutland Street, Hulme, Manchester.

WANTED, British or foreign land and freshwater shells. Can give in exchange, *Cl. biplicata* from Putney, *P. fontinale, P. roseum, Pl. lineatus, Z. radiatulus, V. antivertigo, Balea perversa, Coch. tridens*, &c.—F. G. Fenn, 20 Woodstock Road, Bedford Park, Chiswick, W.

DUPLICATES, *Cataulus pyramidatus, Cataulus Skinneri, Helix Skinneri, Helix Waltoni, H. Gardneri*, and many other rare shells from Ceylon. Wanted, rare fossils from Upper Miocene of France and Italy, or state offers.—J. E. Linter, Arragon Close, Twickenham.

BRITISH marine shells wanted in exchange for *Kellia suborbicularis, Mya Binghami*, and others.—G. O. Howell, M.C.S., 3 Ripon Villas, Ripon Road, Plumstead, S.E.

I SHALL be happy to send types of Suffumata and numerous other insects free to beginners in the study of entomology. Box and return postage to be sent.—W. Macmillan, Castle Cary, Somerset.

A BEGINNER would be glad of a few duplicates of land, freshwater, and marine shells; algæ, beetles, however common, would be thankfully received, postage paid and acknowledged.—Xema, 28 South Street, Carlisle.

FOR small piece of "cementstein" from Mors, Jutland, (easy to clean and rich in diatoms), send stamp and address to—H. Morland, Cranford, near Hounslow.

BOOKS, ETC., RECEIVED.

"Our Insect Enemies," by Theodore Wood. (London: Soc. Prom. Christian Knowledge.)—"First Year of Scientific Knowledge," by Paul Bert. (London: Relfe Bros.)—"British Cage Birds," Part I., and "The Book of the Goat," Part I. (London: L. Upcott Gill.)—"American Monthly Microscopical Journal."—"Cosmos."—"Reports of the Botanical Exchange Club of the British Isles for 1883 and 1884."—"Proceedings of the Literary and Philosophical Society of Liverpool, 1883-4." (London: Longmans.)—"Science."—"Journal of the New York Microscopical Society."—"The Canadian Entomologist."—"The Amateur Photographer."—"Ben Brierley's Journal."—"The Rochdale Field Naturalists' Journal."—"Feuille des Jeunes Naturalistes."—"The Garner."—"Animal World."—"The Naturalist."—"Proceedings of the Liverpool Geologists' Association."—"The Midland Naturalist."—"Journal of the Quekett Microscopical Club."—"Catalogue of Collins' 'Special' Micro Slides."—"The Lost Voice." (Medical Battery Co.) "The American Naturalist."—"Proceedings of the Academy of Natural Sciences, Philadelphia."—K. F. Koehler's Antiquarium, Catalog. No. 428.—"British Moss Flora," Part IX. &c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—E. A. S.—W. C.—J. P.—W. G. W.—H. G.—J. R. B. M.—M. B. G.—T. E. T.—M. E. T.—F. J. R.—T. W. H.—C. C. A.—A. G. W.—T. D. A. C.—W. H. H.—J. H.—J. G. O. T.—W. H.—P. F. L.—J. W. G.—H. L.—A. J.—W. E. D.—F. H. P.—H. W. C.—E. W.—W. K. S.—F. W. E. S.—C. S.—E. D. M.—S. M. M.—J. M.—A. D.—J. B.—H. W. C.—H.—W. R. W.—H. M.—H. W. V. B.—J. T. R.—A. K.—J. C.—J. B.—J. E.—M. E. T.—W. A. C.—A. W. F.—J. A., jun.—G. R.—J. M.—C. J.—S. J. H.—J. S., jun.—E. A.—G. C.—W. S.—J. B.—G. A. B.—J. B.—F. C. K.—A. P.—C. C.—E. H.—W. H. H.—W. S.—J. W.—J. E. L.—J. I.—R. S.—W. M.—C. F. W.—W. P. E.—D. O.—G. O. H.—F. H.—J. L.—S. H.—F. R. R.—G. S.—C. C.—F. G. F.—J. R. R.—L. J.—H. P. D.—E. W., &c. &c.

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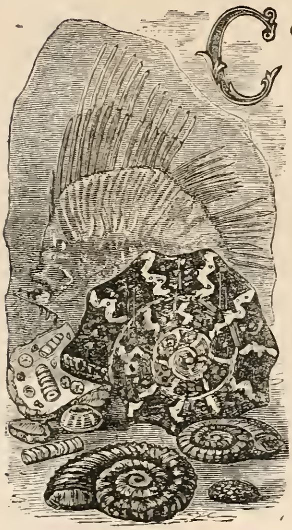
EGGS OF ACARUS OF VULTURE

× 70

GRAPHIC MICROSCOPY.

By E. T. DRAPER.

No. XXIV.—Eggs of Parasite of Vulture.



COMMONLY surrounded with uninviting associations of decay and pollution, the Apterous, or wingless insects, have to the uninitiated a reputation of repulsiveness and inherent ugliness ; but without comparing them for beauty with creatures of a higher class, they are found under microscopic examination to possess an interest essentially their own. Possibly no other order shows, from the egg to perfection, a greater diversity of form, or more quaint embellishment.

The division Anoplura, commonly known as lice, are parasitic on mammals and birds. The plate represents the eggs of the species infesting the feathers of the vulture. The number of varieties is very extensive, and the egg necessarily greatly diversified in configuration. Many are beautifully sculptured, and provided with contrivances in the shape of covers and lids. Almost every bird has a distinct variety, some two or three, and different forms of egg may be found in distinct and separate localities, in the breast and neck, and on the under side of the primary wing feathers. Birds in captivity suffer severely, but scarcely any of the feathered tribe escape. Specimens of the rarest beauty may be obtained from the pheasant.

Of the Acarina, or mites, a wide and interesting field is open to the young microscopist. Found wherever there is decay and mouldiness, even in the cavities of the bones of skeletons, they may be regarded as ubiquitous. Many are extremely curious in shape and adornment, well exemplified in a beautiful specimen of a wood mite of the genus Oribata, procured from Mr. C. Collins, jun., of Harlesden. It presents an extraordinary appearance ; the development is, egg, larva, nymph, and the adult male and female. The nymph changes, or partly moults its skin, four or five times, carrying the cast skins on its back overlapping each other, and being necessarily of various sizes they give the appearance of its being surrounded with a series of flounces. The creature in this condition seems tricked out with a general assortment of frippery and furbelows. The reader is referred to Mr. Michael's papers, and beautiful plates on this interesting species in late numbers of the "Journal of the Microscopical Society."

Those who have not access to the writings of Nicolet, Claparède, C. L. Koch, and others, on the Acarina, can procure a cheap handbook, "Economic Entomology ; Aptera," by Mr. Andrew Murray, published by Chapman and Hall, by order of the Committee of Council on Education. It is lavishly illustrated with typical forms, well indexed, and forms a valuable key of reference to more exhaustive research.

Crouch End.

TEETH OF FLIES.

By W. H. Harris.

No. VIII.

"*FUCELLA FUCORUM*," Fallen.

THIS fly was taken on debris cast up by the tide on our coast during the latter part of October, but may, very probably, be taken in other situations if diligently searched for. There is nothing very peculiar in its general appearance to attract attention, and it is therefore rather difficult to describe satisfactorily, so that it may be recognised by the collector. It is a rather small fly, being not more than about a

quarter of an inch long. The thorax is of a drab or greyish-brown colour, with a fairly well-defined stripe of a slightly darker shade centrally situated. The dorsal portion of the abdomen is slate, or lead colour; the ventral, a trifle lighter. Each segment of the abdomen bears two spots of a darker hue, but which disappear on looking at the creature with the head pointing towards the observer. The thorax and abdomen are fairly clad with tolerably short hairs, the legs are of the same colour as the abdomen, the eyes a chocolate brown. The proboscis, for about half its length, is fleshy; the remaining portion, towards the extremity, being considerably harder, but scarcely chitinous. When dealt with microscopically, it will be found that the lobes of the labium, although small, are capable of being expanded, and then reveal a rather interesting set of organs of dentition. These consist of primary, secondary, and third sets of teeth in some portions of the mouth. Viewing them in a lateral position, the primary set are six in number, the two marginal members being of the same type as the blow-fly; then follow on one side (which in its natural position is the fore part of the mouth), two teeth somewhat similar, yet presenting a slight change in form, inasmuch as one of the two points which terminate the organ is considerably longer than the other. One tooth of this form also succeeds the lateral one at the back of the mouth, but it will be observed the long point is here reversed. The remaining tooth of the primary set is rather remarkable, as it bears three points, and, when looked at with an eighth of an inch power, conveys the impression that a minute molar is being observed. These are all rather dark in colour, and, for the size of the creature, very strong.

A modification of the basal portions of the pseudotrachea form the secondary and third sets of teeth. The bases spring from different parts, and become united as they approach the free end. They are very thin and delicate in structure. On comparing this example with preceding illustrations, it will be found to be by far the most minute yet dealt with, yet a comparatively powerful set of organs are presented; in fact, it would appear that the size of a fly has practically little to do with the general arrangement beyond limiting the size of these organs, but that the nature of the food has probably a much closer bearing on the subject.

Fig. 180.—Teeth of *Fucella fucorum*.

PRESERVATION OF THE EYESIGHT.

I OBSERVE with great pleasure that one of the Christmas Annuals has been printed on green paper with the type in blue ink, with the praiseworthy intention of saving the eyesight of readers.

The subscribers to SCIENCE-GOSSIP probably use their eyes more diligently than most persons, both in reading, drawing, working with the microscope, and examining minute objects; this is a question therefore that interests them nearly.

I think it well to point out that, while the book printed as I have described may be better than similar works printed upon dead white paper, the colours of both the paper and the type might be greatly improved. The paper is too much of a bluish-green, and the ink is too bright a blue. Were the paper more of a yellowish-green, and the type dark olive-green, the result would be much more restful to the eyes. I find it is a great benefit to read this book through glasses of a smoky brown tint; the letters appear a less vivid blue and are much sharper defined. Furthermore, a great benefit might be gained by using heavier type, that is, not larger letters, but letters with the fine strokes thicker than they are usually made.

I believe the publishers of SCIENCE-GOSSIP have already paid some attention to this question, and I trust it will one day bring forth fruit.

JOHN BROWNING.

WE have received a series of six slides from Mr. H. Vial, Crediton, containing admirable anatomical sections, beautifully mounted.

GOSSIP ON CURRENT TOPICS.

By W. Mattieu Williams, F.R.A.S., F.C.S.

IN the October number of "The Popular Science Monthly" is an interesting account of "the trading rat," alias "mountain rat," "timber rat," and trade rat." His place of residence is the Rocky Mountains and adjacent hills. He is larger than our domestic rat, his tail not rat-like, but more like a squirrel's, only less bushy, being covered with fur. Cats are afraid of him, and when unacquainted with human habits he is not afraid of men. The commercial reputation and name of these animals is founded on a curious habit. They help themselves to stores of food, but scrupulously pay by means of barter for all they take. Examples of this are given in detail. The contents of a bread-pan were annexed, none of the bread left, but it was equitably refilled with scraps of leather, chips, bones, mouldy beans, rags, &c. The bread thus abstracted was found carefully stored and hidden in an old tin can, together with bacon rinds, bones, rags, &c. In another case a meal-box was deprived of a portion of its normal contents, and the remainder was mixed with bird-shot. The crown of a new hat was eaten round, and by way of compensation the hat-box was filled with rags, remains of food, wheat and dried fruits. Knives, spoons, watches, and other glittering things appeal to their acquisitiveness, and are accordingly abstracted and hidden away, miscellaneous "dry goods" being substituted for the hardware. Red cloth is similarly attractive, especially as nest-building material. Their remarkable intelligence and natural gentleness suggest the possibility of domestication, and training them to useful industry.

Windmills appear to be looking up. According to Mr. Alfred R. Wolfe, who has published in New York a treatise on "The Windmill as a Prime Mover," their use is increasing, it is now greater than at any other period in the history of the world. We are so accustomed here to regard them as antiquated and superseded by steam-engines, that this statement will be doubtfully received by many. Mr. Wolff states that in some cities of the United States, on an average, over five thousand windmills are manufactured annually. They are chiefly used for domestic purposes, such as pumping and storing water in isolated country houses. We are also informed that great improvements have been made, that the American patterns are superior to those of Europe. This should be the case, as our European engineers (excepting Dutchmen) have scarcely condescended to look at such old-world contrivances during the age of steam. Modern science must surely be able to contribute something in this direction.

The motion of the wind is the most economical and generally distributed source of power available by man, and certainly should not be neglected. The principal objection to it, its variability, may now be overcome by the use of compressed air and electrical accumulators. At our present rate of coal wasting a scarcity of that source of power in this country is within easily measurable distance, and it is well to know that a substitute exists, one which, if but partially utilised, might supply us with a vastly greater amount of horse-power than all our steam engines ten times told.

The testimony of Mr. Mitchell Henry concerning the merits of the Caucasian variety of the prickly comfrey (*Symphytum asperrimum*) is of great value. Having visited him at Kylemore Castle, and seen what he has done there in converting great areas of the most obstinate of Irish bog wastes into luxuriant meadows and arable land, and the mountain slopes of the Connemara desert into lovely gardens and most luxuriant shrubbery, with choice and tender exotics flourishing where gloomy chatterers and indolent landlords tell us that ordinary timber cannot thrive on account of the wind—I read the letter in the "Times" with much interest and perfect faith in its practical reliability. Instead of making an abstract of it here as at first intended, I enclose it to the editor to reprint in full, as I cannot condense the plain statement of facts without omitting useful information. The agricultural transformations in the neighbourhood of Kylemore Castle present the most interesting and hopeful sight I beheld during three summers' wandering through Ireland. If every Irish landlord did his duty as Mr. Henry has done, Irish misery would be at an end, and the demand for Irish labour on Irish soil would effect a considerable re-emigration of true Irishmen from America.

"A Paying Crop.

"*To the Editor of the 'Times.'*

"Sir,—I have occasionally sent you notes from this place on agricultural matters, and it may now be useful to the farming interest to receive a confirmation of the great value of a crop introduced of late years into the United Kingdom as a forage crop, inasmuch as conflicting statements have been made about it. I refer to the Caucasian variety of the prickly comfrey (*Symphytum asperrimum*).

"Five years ago I obtained a small supply of the roots from a London agent, and planted them in a light sandy soil in which they did not do very well. The roots were then taken up, divided like Jerusalem artichokes, and transplanted into reclaimed peat land, receiving a good supply of farmyard manure. Here the prickly comfrey has flourished amazingly, and by subdivision now covers several acres. It has been cut this year already five times, and will be cut again before Christmas, yielding by careful weighing after the present fifth cutting a total of 40 tons to the acre.

"The plant is uncommonly handsome, and when planted should have intervals for its growth of not less than two feet, and when gathered it should be

cut down even with the ground and receive a dose of liquid or other manure. Cattle eat it greedily, and it is excellent for dairy cows as it does not flavour the milk. I have seen it stated that the roughness of the leaves makes it distasteful to cattle, but this is an error. It is an invaluable food for pheasants, ducks, and all kinds of fowl, and if chopped up for them in that most useful instrument, Starritt's American circular cutter, and mixed with barley meal or crushed Indian corn, it fattens them rapidly, and saves a third of the grain. I have had two of these mincing machines, one large and the other small, both purchased from Gilbertson & Page, Hertford.

"Like all broad-leaved plants, which derive much of their food from the air and the rain, comfrey grows best wherever swedes and mangolds flourish, and amply repays the expenditure of a fair supply of manure. It has been stated that no manure is wanted, but this, as regards all plants, is nonsense, for in some way or other you must restore to the soil what you have taken out of it, and root crops especially exhaust the soil. Preserved as ensilage prickly comfrey does not seem to have done very well, and the product is unusually disagreeable in smell.

"It may be added that the common English comfrey used to be employed as a poultice or to stop bleeding, for it contains much mucilage.

"I am, Sir, faithfully yours,

"*Kylemore.* "MITCHELL HENRY."

Dr. Fiordispini, Director of the Manicomio, the great lunatic asylum of Rome, tells us that among a staff of 327 persons in that establishment who are engaged in watching and attending the insane 3·98 per cent. have themselves become insane. This amounts to 1 in 25 persons, while of the entire population of Rome the proportion is only 1 in 585; or otherwise stated, the attendants at the asylum are 23 times more liable to insanity than people outside. Dr. Fiordispini connects this with the tendency to imitation, or moral infection. The history of mankind in all countries plainly demonstrates that moral epidemics have prevailed either by imitation or some influence that is very imperfectly understood. The facts stated by Dr. Fiordispini plainly teach, that no persons having even the remotest hereditary tendency to insanity should seek employment in a lunatic asylum.

The Japanese are doing good service to science and to themselves by the systematic study of earthquake movements, and the British Association is co-operating with them. By suitable instruments, seismographs, the movements of the earth are made to describe themselves, to draw their own portraits on suitable paper. These diagrams tell a great deal, and to render them more expressive, artificial earthquakes have been made by exploding dynamite in the ground, dropping cannon-balls from various heights, and otherwise shaking the earth in a definite manner, so as to compare the seismograph diagram of an artificial disturbance of known character with the natural disturbance, and thus lead on to explanations of the natural phenomena. Last year eighty natural earthquakes were specially studied by the British Association Committee, the year before thirty-nine, and the year preceding that twenty-six. The Japanese have seismographs in their coal-mines as well as above ground. The results are very interesting, but too elaborate for me to attempt anything like a general account of them here, beyond describing a very practical application of these researches, viz., the determination of how to construct a house which shall resist earthquake motion.

This has been done by resting the foundation on cast-iron balls. At first 10-inch shells were used. The record of a seismograph placed inside a house thus constructed showed that although it was subjected to considerable movement at the time of an earthquake, all *sudden* motion had been destroyed. The winds and other causes produced much more serious movements than the earthquake. The house was floating too freely. Then 8-inch balls were tried, then 1-inch, and finally the house was rested at each of its piers on a handful of cast-iron shot of only ¼ inch in diameter; these shot rest between cast-iron plates. The friction in this case was sufficient to resist the disturbing agency of the wind, while the earthquake movements, communicated of course to the piers, merely rolled the shot under the foundation of the house without moving the house itself. I should add that the houses were not of the London suburban jerry order of architecture, not with 9-inch walls made of rotten bricks set in mortar made of dusthole ashes, but were respectable wooden and iron structures. As I have said before, we shall some day take our turn in the matter of earthquakes, and when we do the excessive population of suburban London will be very much regulated, and "the entranchisements of leaseholds" will be radically affected.

Mr. A. Buchan's paper read to the British Association on the Rainfall of the British Islands from 1860 to 1883 is very interesting. One of the most striking facts brought forth is the quantity of rain that falls in Glencoe, viz., 128½ inches. This is the heaviest in Scotland. The average in the regions of heaviest rainfall, viz., Skye, and a large portion of the mainland as far as Luys, on Loch Lomond, the greater part of the Lake District, a long strip including the more mountainous part of North Wales, and the mountainous district to the south-east of Wales, is 80 inches. The smallest rainfall is in the south-east of England. The observations were made at 1080 stations in England and Wales, 547 in Scotland, and 213 in Ireland.

Weather prophets are usually very unfortunate; their failures are generally proportionate to their

confidence of success and the supposed magnitude of their discoveries. I have received a curious newspaper, "The Future," published at Richland, Shawnee Co., Kansas, U.S., which promises magnificently and gives much advice to agriculturists.

I was a boy when London was thrown into a spasm of temporary insanity by "Murphy's Weather Almanac." It was all done by one lucky hit. Anybody may make an almanac and predict the weather for each day in the year, and be right more frequently than wrong, by simply taking the averages from meteorological observations and predicting accordingly; but Murphy was bolder than this. He predicted that a certain day early in the year would be phenomenally cold, and it was so; 28 degrees below freezing in Hyde Park. Then followed a rush to buy the almanac, and a ridiculous excitement. Songs were sung in the streets, and wild stories were told of the magnetical and electrical discoveries of the great meteorological Murphy.

In spite of all our meteorological observatories and observations, we are still unable to make any far forward predictions of weather beyond stating probable averages. Storm warnings are fairly reliable, but these and the rest of the daily forecasts of the Meteorological Office are not exactly predictions. They are statements of atmospheric movements that are proceeding in certain directions, and which, if they continue, will reach certain localities a few hours later. They do commonly continue as anticipated, but not certainly. About eighty per cent. of the forecasts are fulfilled, and the rest are failures.

A really valuable contribution to weather-wisdom was read at the last meeting of the British Association by Dr. Courteney Fox, "On Some of the Laws which Regulate the Sequence of Mean Temperature and Rainfall in the Climate of London." These laws are induced from observations extending over the last seventy years. They are necessarily empirical, *i.e.*, all mere generalisations of average fact, not deductions from necessary causation. Dr. Fox finds that if a spring or a summer be very cold, the succeeding season will be cold, and that warm autumns succeed very warm summers. It is very rarely that a dry August is followed by a wet September. A very wet and cold summer is usually succeeded by a cold autumn. If January, April, June, July, August, September or December are very cold, the succeeding month will probably be dry. Very warm January, expect a dry February. The next month following a very warm June, July, or August will be warm. Very wet January, March, or April, usually followed by a warm month. Warm and wet November and December, wet month to follow. Warm and wet January, expect a warm February. A warm month usually follows a warm and dry June or July, and a wet September follows a warm and dry August. Cold and wet July and August, expect cold month to follow. Cold and dry December, expect cold January. Cold and dry November, expect dry December.

A difficulty is suggested on reading these indications, viz., that of finding when the changes come. In nearly all the cases specified the order for the next month or next season is, "As you were." I suppose that we must read all these descriptions of the preceding period as intended for exceptional weather, and that such weather usually shades off gradually, while the more decided changes more commonly follow average weather.

I am glad to find among the papers read in Section B (Chemistry), one by Professor Odling, which has the merciful intent of relieving us from some of the structural names which are daily poured upon the unhappy student of organic chemistry. Every plant that has an odour, or has a flavour, or contains any thing that has any special property, may be tortured until it yields some substance with real or imaginary special composition and properties, and every such substance may be physicked with strong acids or strong bases, or chlorine, iodine, bromine, &c. &c., and forced into some sort of combination with these; and the compounds thus formed may unite with other compounds, and thus on, *ad infinitum*. Millions of millions of such things may be concocted, then analysed, then formulated, and then named according to their imaginary molecular constitution. Now that we have hundreds of young aspirants for chemical fame who devote themselves to such mixing, and messing, and analysing, and naming, the torrents of papers poured into the learned societies combine to produce a flood that is simply maddening, and would drive all our chemists into lunatic asylums, but for a protecting providence which has ordained a beneficent law that operates with stern rigidity; viz., that nobody but the author and the printer ever reads these papers. I pick up at random the two last numbers (October and November) of the "Journal of the Chemical Society," and find among the abstracts of papers on Organic Chemistry more than a hundred of these new substances discovered during each current month. This has been going on for years, and may go on for ever, if the supply of ordinary laboratory aspirants is maintained. As an example of the sort of names which Professor Odling desires to reform, I will quote two or three from one of the numbers of the journal above named. "*Orthochlorocarbonylphenylorthophosphoricdichloride*," obtained by R. Anschütz, and re-named as above, its original name given to it by Couper, *trichlorophosphate of salicyle*, being too short (page 1062). "*Tetrachloroquinonemetanitraniline*," obtained in black crystals by M. Niemeyer, together with a dozen of other chemical cousins (page 1066). E. Bamberger and S. C. Hooker present us with several of their new-born chemical babies, among which is one that bears the pretty name of "*hydroxyisopropyldiphenyleneketonecarboxylic* acid," which is described as "a strong

acid containing only one carboxyl group" (page 1070). When its younger brothers, containing several carboxyl groups are born, and named according to their more complex composition, the result may be imagined. These are all culled from pages 1062 to 1070 of the October number. I have marked others in the November number, but in mercy to my readers will not quote them.

Professor Odling proposes to supply empirical names instead of these, justly observing that "the primary purpose of a name is undoubtedly to designate and not to describe." In "The Gentleman's Magazine" of October, 1880, I illustrated the result of this principle of naming a thing by a description of its composition, by applying it to the case of our familiar Christmas-pudding, *Suetofloureggcandiedpeelraisinspicecurrantsconglomerate*, would thus be its pretty little title.

As the primary object of 99·9 per cent. of the researches which produce these violent neological outbreaks is to establish the reputation of the analyst, why not carry out this purpose more effectually by bestowing upon these new concoctions the names of their parents, with a distinctive prefix? Thus Smith's chemical first-born might be named Alpha Smith, his second Beta Smith; then Gamma, Delta, and on to Omega Smith. After this Alpha A. Smith, Alpha B. Smith, &c., to the end of the Roman alphabet. This would supply $24 \times 26 = 624$ names, after which numerals might be used, 625 Smith, and so on to the required number of thousands.

CHAPTERS ON FOSSIL SHARKS AND RAYS.

By Arthur Smith Woodward.

V.

Myliobatidæ.

SOME of the largest and most pelagic of the living Batoidei are included in this family, and fossil remains of at least three genera are not uncommon in the Tertiary deposits, both of this country and the Continent. One of their most characteristic features, and that which is of greatest interest and importance to the palæontologist, consists in the nature of the dentition. The mouth is armed with a number of flat crushing plates, often united firmly together by sutures and varying in arrangement in the different genera; they are placed in successive transverse series, and as the front rows become unfit for use, they fall out of the mouth, being replaced by new ones from behind. These dental plates, together with specimens of the barbed spine fixed upon the tail of some forms, constitute all the known fossil evidence, and are met with in Eocene strata at Sheppey, Bracklesham, and Barton; in Miocene at various Continental localities; and in the Pliocene Crag of Norwich. The type-genus is *Myliobatis*, in which the six-sided teeth are arranged in seven rows (fig. 181), the median row consisting of much elongated plates, and the three lateral rows on each side, of small hexagonal plates. About eleven species are recorded* from the London Clay, and the Bracklesham and Barton beds, the most important being *M. Toliapicus* and *M. Dixoni*, and associated with them are examples of caudal spines. The dentition of *Ætobatis*, also found in the same strata, differs from that of *Myliobatis* in consisting only of a single row of plates (fig. 182). About six species of this genus have been described from the English Eocenes, but the fact that the teeth

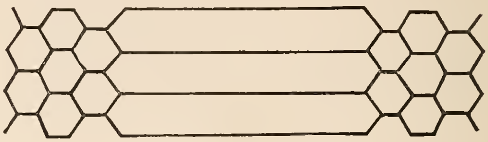


Fig. 181.—Teeth of *Myliobatis*.

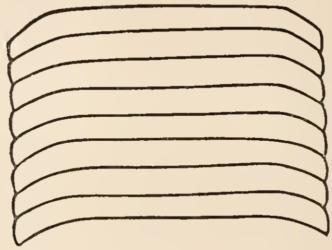


Fig. 182.—Straight teeth of *Ætobatis*.

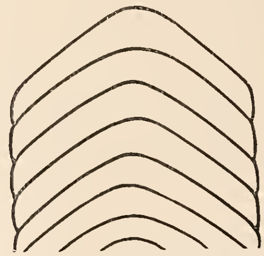


Fig. 183.—Arched teeth of *Ætobatis*.

of one jaw are sometimes nearly straight (fig. 182), while those of the other are considerably arched (fig. 183), renders the specific determination of detached plates somewhat uncertain. *Zygobatis* (fig. 184) is another form, referred to the living *Rhinoptera* by Dr. Günther, and characterised by the disposition of the dental armature in seven longitudinal rows, as in *Myliobatis*; here, again, the plates are six-sided, and also united to form a tessellated pavement, but besides the relatively great breadth of the middle series, the two adjacent rows are also considerably elongated in a lateral direction, and there are thus only two

* Dixon's "Geol. and Foss. Sussex," 1st edit., pp. 197–200; see also "Agassiz' "Rech. Poissons Fossiles."

rows on each side that comprise approximately true hexagons. *Z. Woodwardi* (Agassiz) occurs in the Norwich (Mammaliferous) Crag of Norfolk, and other species are known from the Swiss Molasse (Miocene).

above, are merely placed temporarily in the respective positions assigned to them upon somewhat slender evidence, but the relics to be considered in the present section are even less satisfactory in the features they display, and can thus only be relegated

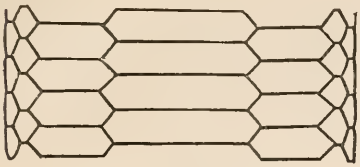


Fig. 184.—Teeth of *Zygobatis*.

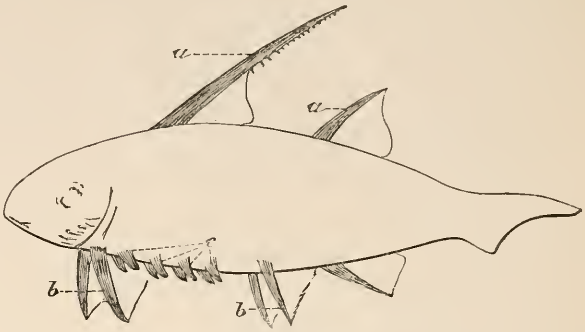


Fig. 185.—Outline of *Parexus incurvus*.

Fig. 186.—Spine of *Onchus*.

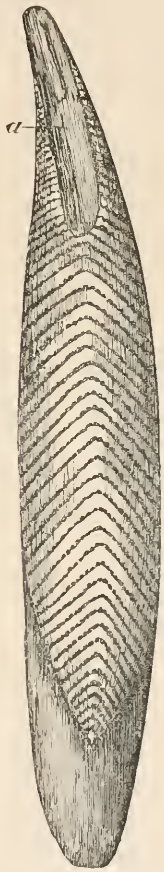


Fig. 187.—Spine of *Gyracanthus tuberculatus*. (One-third nat. size.)

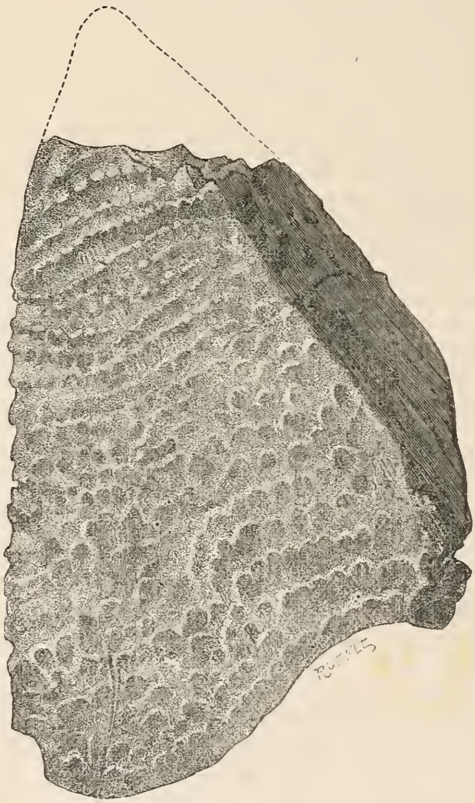


Fig. 188.—*Oracanthus Milleri*. (After J. W. Davis.)

ICHTHYODORULITES.

In conclusion it only remains briefly to treat of a series of Selachian fossils that exhibit no characters sufficiently distinctive to justify their reference to any particular group or family. Many forms, indeed, that have been already mentioned

to a provisional group until the discovery of more complete specimens reveals their true affinities. These are the detached fin-spines of cartilaginous fishes, frequently met with in a fossil state, and known under the general name of *Ichthyodorulites* ("fish-spine-stones"). They were first so designated by Buckland and De la Beche, followed by Agassiz,

and as it is the custom to restrict the term to those spines whose precise relationships are indeterminable, in consequence of their never having been found in association with definite fragments of the rest of the fish-structures, to which they originally belonged, the number of forms included in this category has been considerably reduced by the progress of research. Among those removed, for example, are the Devonian *Parexus* (of which an outline is given in fig. 185), the Carboniferous *Ctenacanthus* and *Pleuracanthus*, alluded to in previous articles, the Jurassic *Leptacanthus*, now known to belong to a Chimæroid (*Ischyodus*) and many others. But there are still a large number that can be referred to no very definite place, and though they may not all be truly Selachian—as is quite probable, and has proved to be the case with *Parexus* and *Leptacanthus* just mentioned—it will be convenient to group the whole together until our information becomes more complete. Some forms appear to have been placed in front of dorsal fins (as shown in the drawing of *Spinax*, Vol. XX. p. 172, or in fig. 185, *a*); others were almost certainly pectoral or ventral fin-spines and perhaps situated like those of the curious Acanthodian fishes (fig. 185, *b*); and others, again, may correspond to the little triangular dermal scutes (fig. 185, *c*) that are also to be found in pairs in the same primitive tribe. Nearly all are ornamented on the external surface with variously disposed ridges and tubercles, often enamelled, and the portion embedded in the tissues of the body—the extent of which varies considerably in the different forms—is usually smooth or finely striated. Moreover, all agree in being destitute of any articular facettes at the lower end, thus indicating the cartilaginous state of the skeleton with which they were once connected; and the presence of an internal cavity, opening lengthwise behind and below, or simply in a hole at the base, is also evidently a constant character.

The earliest of these dermal weapons hitherto described is the little *Onchus* (fig. 186) from rocks of Upper Silurian age. With the exception of *Scaphaspis ludensis*, from the Lower Ludlow of Leintwardine (Shropshire), and the doubtfully piscine conodonts, it is the oldest evidence of the existence of vertebrate life yet known. In Britain, it occurs in the celebrated Ludlow bone-bed, and in the passage beds between the Silurian and Old Red Sandstone strata of the same area, and quite lately, spines of a similar type have been recorded* as occurring in beds of a slightly earlier date in America; but the remains originally ascribed to this genus from strata of the carboniferous period appear, from more recent discoveries, to belong rather to such forms as *Physonemus* and *Ctenacanthus*. The external surface is characterised by thick and smooth longitudinal ridges, and the most distinctive feature of the spine is the absence of posterior denticles.

The Old Red Sandstone and Devonian—at least in this country—yield no ichthyodorulites of importance, but almost all divisions of the Carboniferous are replete with examples of the greatest interest. The largest forms hitherto discovered are met with in the Carboniferous Limestone, *Phoderacanthus grandis*,* from Bristol, probably attaining a length of no less than three feet. Among others, we may especially refer to those known under the names of *Gyracanthus*, *Orthacanthus*, *Acondylacanthus*, *Lepracanthus*, and *Erismacanthus*.

Gyracanthus is a genus first established by Agassiz, and more completely elucidated since by the researches of Hancock, Atthey, and Traquair, upon a much larger series of specimens: it ranges throughout the whole of the Carboniferous strata, though not yet known to extend either above or below, and is so-called in allusion to the peculiar appearance of the spine produced by the arrangement of the ornamentation (fig. 187). The ichthyodorulite is characterised by its very slightly compressed form,—almost round in transverse section,—by an extensive internal cavity, and a long base of insertion; some examples are of considerable size, attaining a length of sixteen or eighteen inches, and almost all that are referable to adult fishes exhibit a long worn surface at the tip (fig. 187, *a*), evidently due to constant friction with the bed or sides of the water in which their original possessors lived. It is further noticeable that—instead of being symmetrical—all these spines are distinctly "lefts" and "rights,"—a fact suggesting that they occurred in pairs, and taken in conjunction with the wearing of the tips, doubtless indicating that they were placed in front of pectoral or ventral fins. Messrs. Hancock and Atthey† believed, also, that they had discovered a few symmetrical spines of the same type, and hence regarded the latter as dorsal; but Dr. Traquair‡ has more recently shown that there is no unquestionable basis for such a conclusion, and considers it to have been founded upon imperfect materials. Associated with the ichthyodorulites, there often occur patches of small dermal tubercles, and occasionally also curious triangular bodies, once looked upon as the carpal cartilages of *Gyracanthus*. These are hollow and open at the base, with a roughened surface destitute of any ornamentation, and, from a study of their microscopical structure, Dr. Traquair has determined that they are truly dermal appendages. The number of species already described from British rocks is about seven, and the best known appear to be the *G. tuberculatus* and *G. formosus*, of which the coal

* E. W. Claypole, Quart. Journ. Geol. Soc., xli. (1885), p. 61.

* J. W. Davis, Trans. Roy. Dublin Soc., Ser. 2, Vol. I. (1883), p. 534, pl. lxv. Since description, the original specimen of this fine ichthyodorulite has been presented by Earl Ducie to the British Museum, where it is now to be seen.

† Ann. and Mag. Nat. Hist., [4] I., 1868, p. 368.

‡ *Loc. cit.*, [5] XIII., 1884, pp. 37–48.

measures of Northumberland have yielded a most extensive and instructive series, now in the Newcastle Museum.

The spines included under the name of *Oracanthus* (Agassiz) are of a very curious and problematical nature; they are more or less triangular in shape (fig. 188), sometimes twelve or fourteen inches in length, and ornamented externally with transverse rows of blunt tubercles or irregular ridges, but exhibiting no broad smooth surface for insertion in the soft tissues of the body. All possess a large internal cavity, opening at the base, and seem to have been originally arranged in pairs, for (like *Gyracanthus*) they are invariably "lefts" and "rights," and some show traces of terminal abrasion. *O. Milleri* (fig. 188) is the species to which the majority of the British fossils are referred, and with it Mr. J. W. Davis has recently* associated a number of dermal plates of various forms, on account of the close resemblance of their ornamentation; if the latter are correctly so placed, *Oracanthus* must have possessed a strong covering of armour—at least, in the region of the head, but any satisfactory evidence as to the facts is at present wanting. The genus appears to be exclusively confined to the Lower Carboniferous, the most abundant remains being those of *O. Milleri* just mentioned, from the Carboniferous Limestone of Bristol and Armagh, while others named *O. pustulosus* are sometimes met with in the equivalent beds of Oreton, Shropshire.

(*To be continued.*)

* Trans. Roy. Dublin Soc. [2], I. pp. 525–531, pls. lxii–lxv.

ASTRONOMY AND METEOROLOGY FOR THE MONTH.

By John Browning, F.R.A.S.

VENUS will be an evening star throughout the month in Capricornus. She rises about eleven in the morning, souths about three in the afternoon, and sets at times varying between 7.12 and 8.3. Mercury will be an evening star until the 20th, and a morning star after that date, rising at times varying between 9.42 A.M. on the 3rd, and 6.21 on the 31st, and setting at 5 P.M. on the 3rd and 2.49 on the 31st. Mars will be in Leo, and will be in conjunction with the moon on the 27th at 9 o'clock in the morning, rising at 10.50 P.M. on the 17th, southing at 5.33 A.M., and setting at 0 hr. 13 mins.

Jupiter will be in Virgo, and will be in conjunction with the moon on the 28th at 9 o'clock in the morning. He will rise on the 3rd at 1 hr. 18 min. morning, south at 7 hr. 22 min. in the morning, and set at 1 hr. 26 min. in the afternoon.

Saturn will be almost stationary in Gemini, and will be in opposition on Dec. 26th at 10 in the morning. He will rise at 5.27 in the morning on the 3rd, and about thirty minutes earlier each succeeding week.

There will be an occultation of Uranus on Dec. 1st. The planet will disappear at 5 o'clock in the morning and reappear at 6 hrs. 9 mins. There will also be occultations of κ Virginis, μ Piscium, τ Leonis, and θ Virginis, but these stars being all about the 5th magnitude their occultations will possess little interest.

It is a highly interesting question how quickly the new star in Andromeda appeared, that is whether it was first visible to any observer faintly and then became brighter and brighter until it attained its fullest magnitude, which was probably about the 7th or 8th of October. For my own part I should think it must have almost flashed into existence at once, because the great nebulæ are constantly watched by so many observers that I do not think it could have been present for more than two or three evenings without being seen. Mr. Benjamin Kidd, of Bramley, Surrey, appears to have seen it at least two days before any other observer, as he noticed it on the 1st of September, though he did not write to Greenwich Observatory until the 3rd of September, because he waited to see it again.

Mr. Frank McClean, of Rusthall House, Tunbridge Wells, informs me that, seen with his 10-inch achromatic, the star on the 10th of November was scarcely brighter than many of the surrounding small stars, that is, it had waned probably to about the 12th or 13th magnitude.

I shall be glad of any further information on this subject.

In No. 2690 of "Astronomische Nachrichten," the attention of observers is called to the Searching-Ephemeris for the periodic comet of Olbers of 1815, contained in Nos. 2613 and 2614 of that periodical. Its perihelion passage is calculated to occur on the 17th of December, 1886, with an uncertainty, one way or another, of 1·6 year. During its apparition in 1815 this comet remained a telescopic object. Its orbit was calculated by Dr. Olbers.

The sun will enter Capricornus at 3 o'clock in the afternoon on the 21st of December, when winter will commence.

The month of November was unseasonably cold, being about 5 degrees Fahrenheit below the average, and there were several night frosts.

The average temperature for London in December, taken from observations of a period of fifty years, is 40°, while at the Land's End it is 46°, the difference being due to the action of the ocean. The average rainfall for the month in London is between two and three inches.

M. Robin, the celebrated French histologist, author of "The Natural History of Vegetable Parasites in Man and Animals," has just died at the age of 64.

MY GARDEN PETS.

By Edward H. Robertson.

Part IV.

Upon the close of the honey harvest, about the end of July, after which usually follows the hottest period of the year, *Apis mellifica* appears to get into an uncomfortable condition of body, which brings about a somewhat unamiable condition of mind. The fierce heat, the plundering of their store, and the rude treatment to which at such times they are unavoidably subjected, beget in them a chronic state of irritability, at which can we wonder? and the careful beekeeper, as far as possible, avoids any cause of provocation.

The sordidness of many modern apiarians leads them, not only into plundering their industrious servants of the whole of their sweet store, to the very last drop, giving in exchange, too often, the veriest trash, and barely sufficient even of that to keep them from actual starvation, but, also, to the habitual extraction of honey, from comb containing brood. The apiarian is never happy unless he is meddling with his pets! little wonder then that the much persecuted little fellows become irascible, that brood perishes, that stocks dwindle—and that foul-brood is disseminated throughout the length and breadth of the land. I should consider myself little better than a lunatic if I ever extracted honey from a comb containing brood, and never, unless honey be very abundant, do I take any from the hive—bar frame or skep.

When an angry bee means mischief he emits a remarkably pungent, but not unpleasant odour—probably formic acid; when this is perceived let the timid bee-keeper take to his heels, if he would avoid a sting—or rather stings, for the odour seems a signal which arouses the ire of other bees, and, almost before he is aware, he is surrounded by an angry host, who will soon put him to ignominious flight. As the odour, although frequently perceptible when bees sting unintentionally through pressure or injury, is much fainter at such times, it seems probable that its emission is as much under the insect's control as are the odours emitted by many animals under the influence of anger, fear, &c.

A sense of justice here impels me to record that *Apis mellifica* is a thief. Some bees appear to take kindly to robbing as a profession, but, as a rule, they evidently rob to obtain possession of stores they know to exist not for their own use, but rather for that of their friends. The sagacious little rascals realise that the well-being of future generations depends upon the labours of the present, and when supplies are short, or are becoming so, they seek to replenish them in the readiest way that offers. There is nothing selfish in a bee's nature, his unselfish object is the good of the community, and in pursuit of this object he not only lives, but also, it may be truly said, dies. How pertinaciously the rascals will hover and zig-zag close to the mouth of the hive selected for their attentions, few but experienced apiarians would credit—keeping the watchful sentinels ever on the alert, sometimes for weeks together. In any case a great sacrifice of bee life is the inevitable result of these marauding expeditions, for not only do not the burglarious proceedings of the robbers pass unpunished, as evidenced by the frequency of the conflicts, but the tiny heaps of slain that at such times appear on the ground beneath doubtless consist of the bodies of both defenders and assaulters. I give no quarter to these robbers. I have but one punishment for them—death, and being quick-sighted and deft-handed, many a raider falls beneath my scissors. Snip! and a headless carcase tumbling into the midst of the crowd, always on such occasions gathered around the gates of the citadel, is seized upon by the enraged defenders, who, dragging it to the edge of the board, tumble it over where it helps to swell the heap beneath.

Scissors-slaughter is all very well as an adjunct to other and better plans, but of itself will not go far towards keeping robbers in check. The best plan is to narrow the entrance to the hive, and to give a liberal washing of carbolic acid and water, which soon scares away the would-be-plunderer; the smell of it is, however, such an abomination to bees that it seems too bad to inflict it upon the poor inmates. At times it becomes absolutely necessary.

The best antidote to robbing is to keep every hive in the apiary thoroughly well supplied. The danger to your stocks will then generally arise from your neighbours' bees, but if your stocks be strong they will be more than a match for them.

Of the many pretty sights to be witnessed in the insect world not one, in my estimation, surpasses that to be seen when a newly hived swarm of bees is to be transferred from a skep to a bar frame, or other hive. The skep containing the swarm is, usually towards evening, carried to a spot where, upon a lawn or other level plot of ground, has been spread a sheet, upon one end of which rests the frame hive, commonly slightly raised towards the bees, to afford them more ready ingress. Lifting the skep, mouth downwards, the operator suddenly lets go his hold, and as suddenly again catches it between the palms of his hands, as it descends towards the earth. The sudden jerk precipitates the whole of the bees on to the sheet, the heap spreading outwards as a bag of sand or peas would do, and my astonished pets have become a confused and struggling mass of insect life. A few seconds, when lo! in the twinkling of a eye, every head is turned towards the hive, whose wide open door invites them to enter, and a mighty phalanx is pressing on to the hospitable shelter; the substrata of bees, in

a compact body, remaining quiescent until their companions have passed over them, when they continue the march, and so, until the last bee has entered.

Now and again the queen mother may be seen, as she follows in the wake of her hurrying children, but invariably wriggles her way beneath and between their bodies. It is a pretty and not soon to be forgotten sight, and although oft repeated, one I never tire of looking upon. The singularity of the whole proceeding is that the creatures should so simultaneously be seized with a common impulse, probably one analogous to that which in the face of a common danger impels a panic-stricken multitude to flee—the alert senses, when strained to their utmost, by some inconceivably rapid process of the mind, catching the faintest indications of danger or deliverance.

Let me here remark, that these somewhat hastily arranged notes are intended not so much for the bee-keeper as for the naturalist. To him I would say that the pursuit will afford an inexhaustible fund of pleasant interest. He must, however, permit me to warn him against the adoption of many of the so-called scientific methods of bee-keeping; if some of these were to be generally adopted every particle of pleasure would soon be scienced out of the pursuit, and it is more than probable that, in process of time, every bee would be scienced out of creation.

My pets, like their master, are decidedly old-fashioned, and do not take kindly to any new method not unquestionably preferable to that it is intended to supplant, and surely when we derive both pleasure and profit from the little toilers' labours, it is but just that we should, in return, consider not simply their preservation, but also their comfort. This can be best done by observing three conditions insisted upon by all practical bee-keepers. They must be well fed, and kept warm and dry, and all means to this end should be provided with a view to simplicity, economy, and efficiency. Some of the most advocated of modern methods fulfil none of these conditions, being complicated, costly, and inefficient, and I am not at all surprised that so many persons abandon the pursuit as being risky and profitless. Hitherto I have had no reason to regret my conservatism, for, although during the six years I have kept bees 75 per cent. of my neighbours' stocks have perished, mine have never shown the least indication of unhealthiness, and, if I except the loss of a stock through misadventure, I have never had a single casualty of any kind whatever. To the present day all my stocks are vigorous and strong, how long they will remain so I fear to hope, since a so-called scientific bee-keeper in the neighbourhood, some short time since, informed me that he had lost nearly the whole of his stocks through foul-brood.

Swalcliffe, Banbury, Oxon.

NOTES ON THE LEMMING.

By John Wager.

[*Continued from p.* 256.]

THE sudden advent of such hosts of lemming is naturally a marvel to the peasants, as, indeed, to others—and I met with several who still held to the faith of their fathers, recorded with credence by Pontoppidan and Olaus Magnus before him, that these curious little creatures drop down from the clouds. When at Flaam, in Kaardalen, near Urland, a tall, grave-visaged man said, in answer to my enquiry, "Jeg tror de komma fra himmel, i regn, eller snœ, eller i hvirvelvinde—I believe they come from the heavens, in rain, or snow, or whirlwinds." Others, less certain, asked my opinion respecting this high descent; and a peasant at Graven, on the Hardanger-fjord, where they were numerous at the time, said that on a former occasion they appeared in such numbers and were so destructive that the people were quite alarmed, believing not only that they had dropped from the heavens, but had been sent as a judgment from God. The more intelligent of the Norwegian peasants said they came from the north; but from what particular part of that indefinite region they could not suggest. At Utne I was told that on a former visitation they had, on the approach of winter, drowned themselves by thousands in the Hardanger-fjord. It has already been stated that I met persons in Swedish Lapland who thought the lemming-swarms came from the sea or the clouds; and my friend the Lapland pastor also asserts in a letter, that among the mountains there are peasants who insist that they rain down from the sky, not being able otherwise to account for their sudden appearance in such astonishing numbers.

It is an old belief, and not confined to the vulgar. Olaus Magnus, the learned Archbishop of Upsala, writing in the sixteenth century, says, in the quaint language of an English translation, published in 1658, that in Helsingia and other parts of the North, they "fall out of the air in tempests or sudden showers; but no man knows from whence they come, whether from the remoter islands, and are brought thither by the wind, or else they breed of feculent matter in the clouds; yet this is proved, that as soon as they fall down there is found green grass in their bellies, not yet digested. These, like locusts, falling in great swarms, destroy all green things, and all dyes they bite on, by the venome of them. Their swarm lives so long as they feed on no new grass; also they come together in troops like swallows that are ready to fly away; but at the set time they either dye in heaps, with a contagion of the earth (by the corruption of them, the air grows pestilential) and the people are troubled with vertigos of the jaundice, or they are devoured by beasts, commonly called Lekat or Hermelin, and these ermins grow fat thereby." Pontoppidan does not feel quite sure that

lemmings drop from the air, but states that many persons, both in his own and former times, assert they have seen them thus descend; and that the possibility of the circumstance is admitted by Wormius, Scaliger, and other great men. These philosophers suppose that the embryos of lemmings, like those of frogs and such small fry, may be attracted to the clouds, and there fed, fattened, and dropped down, all ready for French cooks and Laplanders' dogs. But other philosophers, of profounder insight, account for the singular phenomenon by the hypothesis that the mountain fogs—which sometimes, to suit their special purpose, are as thick as water-gruel and much stronger—may lift up the lemmings in multitudes, and carry them off bodily to a great distance; a feat which the incredulous Linneans may disbelieve, but which, nevertheless, is far more probable than that such a fog should abduct a Laplander and his herd—as formerly some of the peasants imagined it was able to do!

It was quite commonly said by the peasants of Norway, with whom I conversed on the subject, that the lemmings make their appearance every ten years; but this statement is not exact, for at Urland, I was told, thirteen years had elapsed since their previous visit, and at Utne and in Vestfjordalen, twelve years. Nor does the statement, that they always proceed from north to south, appear to be invariably correct. Söderhjelm, quoted by Lloyd, says they seem to migrate, in the north of Sweden, to all points of the compass, including a north-easterly direction towards the Icy Sea. Some writers affirm they always begin their migrations in spring, others in autumn. I have never seen lemmings actually on the march; those swarms amidst which I passed almost continuously from the Sogne-fjord, over the Hardanger, and through Thelemarken, might be then gradually extending themselves southwards, but wherever I saw them they were running about in all directions, eating the grass and other herbage; and I certainly saw young ones amongst them, not only on the Urland's-fjeld, but also in the Thelemark, though Pontoppidan says, that in Norway, during their migrations, young ones are never seen. I cannot, therefore, from my own observations, corroborate at all points the following account of their mode of procedure, communicated by my Laplandish friend; nor do I know that he has been an eye-witness of all it relates. It is a good summary, however, of what is known, or commonly stated, on the subject. "So long as the numbers of the lemmings do not exceed the available means of subsistence on the mountain, they there remain; but when its resources prove insufficient to feed the increased multitudes, and famine stands at the door, then out wander they, and on their course eat up all vegetation they are able to attain, desolating large tracts. If during their mountain life they shun water, so much the more spirit and courage in surmounting it they display on their migrations; for they march right onwards, allowing neither rapids nor great waters to dismay them. Many, indeed, perish on these aquatic tours, and after stormy weather the mountain lakes may be seen overspread with dead lemmings; but in great multitudes also they reach the sea-coast, where true to their persistent and fearless inclination they commit themselves to the sea, in which thousands find a grave; and only when it is too late can they be brought to think of turning back. Consequently few regain the mountain, to begin a new migration when their numbers have again augmented beyond its means for supplying them with a sufficiency of food."

Hülphers, an old Swedish author, says that the descent of lemmings upon the low lands forebodes a bad year; and in Norway, when they scream more than usual, bad weather is supposed to be at hand.

NOTE ON COCA.

I READ Mr. Whittaker's short article on *Erythroxylon Coca* with great interest. As a drug it has increased very greatly in use during the last year, from the discovery of the anæsthetic properties of its alkaloid; and it has been found especially useful in ophthalmic cases. In the early part of this year, the demand for the alkaloid *cocaine* increased to such an extent, that the supply fell short of the demand, and the price of the drug went up to almost a prohibitive figure. (Cocaine reached 30 cents per grain.) According to Dr. Squibb (in Ephemeris, May), "There appear to be two very distinct varieties of Coca, the Peruvian and Bolivian, each country claiming each variety as being the best. Each variety is divided into the wild and cultivated leaf. Coca from wild plants is larger and thinner, and is generally considered inferior, but of its inferiority there is much doubt." In Bolivia and Peru, from three to four crops of leaves are procured per annum. The United States Minister Gibbs of La Paz, says that the women pick the leaves by hand, and in doing so are careful not to touch the top of the bush, for if this be touched by man or animal, "it withers and dries up." The consumers of Coca in Peru and Bolivia are the native races, and the habit must have descended from the times of the Incas, since Mr. Gibbs says he has found buried with the ancient Peruvians, small quantities of Coca, and the small earthen vase used with it, to hold the lime or potassa of the coca chewer."

The plant has been grown in the Botanic Gardens of Ceylon for several years past, so that, as Mr. Whittaker suggests, it may start a very lucrative industry in our Indian provinces. As Mr. Whittaker states in his article, opinions differ as to the virtues and effects of the leaves. I do not however think any of his surmises hit upon the true reason for this discrepancy in results obtained by different experi-

menters. The reason is probably to be found in the instability of the alkaloid, cocaine. Few alkaloids are so sensitive to physical and chemical action, and hence the percentage of active ingredient varies greatly in different samples of the leaves. "Leaves dried in damp weather, or pressed into the sacks before being completely dried, undergo a fermentation that destroys the cocaine. The destruction goes on gradually, until the complete disappearance of the alkaloid." (M. Bignon.) In the new edition of the British Pharmacopœia, just published, coca leaves are made official, together with the hydrochlorate of cocaine, and a preparation of this salt with gelatine and glycerine, in small discs, each containing $\frac{1}{200}$ of a grain of the salt.

The coca plant blossoms profusely several times a year, but does not produce seed very freely. It is readily propagated from cuttings. Mr. Whittaker describes the flowers as being white, but in an editorial in the "Pharmaceutical Journal" for July last, the flowers are said to be "yellow, faintly scented." Probably they vary in colour, although, as far as my experience goes, yellow-flowered plants are least prone to produce albino varieties.

J. A. Wheldon.

SCIENCE-GOSSIP.

Another journey across Africa has been achieved, the travellers in this case being two Portuguese explorers, Captain Capello and Commander Ivens. They left Mossamedes, a place on the west coast of Africa, lat. about 15° S. in March of last year, and arrived at Quillimane on the east coast, near the mouths of the Zambesi river in May last. They are said to have discovered the sources of the Lualaba, an affluent of the Congo. It seems likely that the regions they have traversed contain a good many elephants, and therefore much ivory, for they noticed the tsetsé fly which has disappeared from the south-east country, to be very abundant farther north. The connection between the two statements is supplied by the observation made by these explorers, as well as often stated before, that the tsetsé fly abounds where there are plenty of elephants.

The Proceedings of the Bristol Naturalists' Society, 1884–5, came to hand too late to be included in last month's notice. It is more imposing than most similar publications, as it contains a coloured geological map showing the neighbourhood of the Avon from Bristol to Avonmouth, explanatory of a paper on the Sub-aerial Denudation of the Avon Gorge, by Professor C. Lloyd Morgan, F.G.S., three coloured plates of Fungi illustrating notes on the Fungi of the Bristol District, by Mr. C. Bucknall; and a platinotype of a Finn whale which was lately stranded in the Bristol Channel, on which Mr. E. Wilson, F.G.S., curator of the Bristol Museum, contributes some notes. Besides these, Mr. C. T. Druery, F.L.S., gives an account of Apospory in Ferns. On this subject he read a paper before the Linnean Society last year, of which an abstract may be found on p. 164 of this volume. "The Flora of the Bristol Coal-field," Part v. including Dictyogenæ and Floridæ, edited by Mr. J. W. White, concludes the number.

It appears from a review in "Science" of a book by P. de Lucy-Fossarieu, that the Patagonians, who formerly had the reputation of being giants, are of huge make in the upper part of their bodies, but their legs are disproportionately short and slender, and frequently bend outward. It is stated that before the horse was introduced into that region a little over two centuries ago, the natives used to chase the guanaco and ostrich on foot; and it is supposed that their present conformation is due to constant horse-riding. It is suggested that they may have lost as much as two inches in stature owing to the change in their mode of life, which two inches if added to their present height would bring them up to the stature of the giants seen by the companions of Magellan.

Those members of the Dorset Natural History and Antiquarian Field Club whose tastes are Conchological owe a debt of thanks to their president, Mr. J. C. Mansel-Pleydell, F.L.S., for his book on the Land and Freshwater Mollusca of the county. Though said to be taken from the Proceedings of the Society, it forms a volume of nearly sixty pages, in which descriptive text and habitats are given to practically all the species named, while at the end are half-a-dozen uncoloured lithographic plates with numerous figures. These alone would make the book useful.

From a notice which has appeared in "Science" of Thomas Alva Edison, it appears that he was born in 1847, became a train boy on the Grand Trunk Railway; and later on, when the line was completed between Port Huron and Detroit, he set up a printing-office in the baggage-car, employing assistants, and issued therefrom a weekly journal, "The Grand Trunk Herald." His attention was drawn to telegraphy, and he became a telegraph operator, an inventor and manufacturer, and finally an investigator and inventor only. He has already taken out in America about four hundred patents, among the inventions by which he is perhaps best known being those connected with incandescent electric lighting and the phonograph. The account of Mr. Edison is accompanied by a portrait.

It appears that Dr. H. Hoffmann has shown in the case of several diœcious plants, including red and white campions (*L. diur.* and *vesp.*), dog's mercury (*Mer. annua*), and hop (*Cann. sativa*), that the

comparative number of male to female plants is affected by thick sowing, which increases the relative number of male plants. The result is attributed to an insufficiency of nutrition during the embryonal stage.

As a method of destroying infection and insect life, it is said in a contemporary that a bottle of bromine left open all night in the room will answer the purpose. It is to be hoped that no one who is unacquainted with bromine will rashly try to put this into practice, and it is unlikely that any one who has experienced the effects of a little bromine vapour on the eyes will wish to be the first to go into the room the next morning.

EVERYBODY will be sorry to hear that Professor Huxley has been obliged, through continued ill-health, to resign the Presidency of the Royal Society. Professor Stokes is to succeed him as President.

Dr. J. E. TAYLOR, F.G.S., Editor of SCIENCE-GOSSIP, has just returned from a highly successful lecturing tour in the Australian Colonies. His last lecture was delivered at the Melbourne University on "The Origin of the Atmosphere."

ON October 17th, the first telpherage line was opened at Glynde in Sussex. This is a new means by which goods and passengers can be conveyed by means of electricity without driver, guard, signal-men, or attendants. The line is one mile in length, and is used for carrying clay. It is not intended to compete with railways, but to do cheaply the work of horses, tramways, &c.

LIVERPOOL intends to hold an International Exhibition in May next. The corporation have granted a site of 35 acres for the purpose.

DR. THOMAS DAVIDSON, F.R.S., the celebrated palæontologist, has just died at the age of 69. He was distinguished for his researches and numerous publications on the Fossil brachiopoda.

PENNY Science Lectures are being delivered at the Royal Victoria Hall and Coffee Tavern, Waterloo Bridge Road. Sir John Lubbock and Mr. W. Lant Carpenter have already lectured there.

THE third annual session of the Youth Scientific and Literary Society commenced November 19th, 1885, when a general meeting was held at head-quarters, The Tolmers Square Institute, Drummond Street, Euston Road, N.W. The officers for the session are: President, Alex. Ramsay, F.G.S., F.R.G.S., Editor of the "Garner," &c.; Vice-Presidents: (Scientific), J. W. Williams, D.Sc., B.A., F.L.S., &c. (late Pres.), and (Literary), Rupert Parry, F.S.Sc.

COMPOSITE portraiture is again the subject of a paper in "Science," this time by Mr. Joseph Jastrow, who describes how the effect may be produced by a stereoscope, and even from two living faces, without the intervention of photography at all. In the course of his paper he says, that the characteristics of the results are the means of those of the originals employed. Thus the composite portrait of a young lady of twenty and her mother of sixty, gives a lady of about forty, while one of a young lady and her grandmother gives a face more like the mother than like the grandmother or the granddaughter.

THE simplest form of electric lamp for use by surgeons, &c., according to "Engineering," is one brought out by Messrs. Woodhouse and Rawson, in which the use of an external reflector is dispensed with, one side of the lamp bulb being silvered so as to reflect the light.

IN the address of Mr. B. Baker, M.S.C.E., president of Section G in the British Association, he said that at the present time absolute chaos prevails among engineers as to rules respecting the strength of metallic bridges. That a bridge which would be passed by our Board of Trade would require strengthening in different parts from five to six per cent. before passing the German Government or the leading railway companies in America; that iron girders are injured by a change in the weight they support, that which is a relief to a muscle being bad for a bar of iron. "Hundreds of existing railway bridges which carry twenty trains a day with perfect safety, would break down quickly with twenty trains per hour."

GRANO-METALLIC stone is formed of a certain proportion of blast furnace slag and granite, crushed, chemically treated, dried, and mixed with Portland cement, made into paste with alkaline solution, and laid on rough ballast, a smooth surface being given at finish. It is said to be ready for use in twelve hours in ordinary weather. It is both fire-proof and water-proof, and is not slippery, since particles of hard slag always project. It has already been laid down in the Strand.

MR. A. SOMERVILLE, F.L.S., has conferred a great boon on students of British Conchology, by the publication of a list of British marine shells, comprising those of brachiopoda and mollusca proper, after the arrangements in the late Dr. Jeffrey's "British Conchology," including additions up to the present year.

PERHAPS there is no more enthusiastic group of naturalists than is to be found in Yorkshire and Lancashire. Nowhere is the *upward* levelling tendency of natural science more plainly seen. Every town has a society of some kind—sometimes several such—devoted to these studies, and the members include every class of the community, although we are glad to know that the artisans frequently form the chief portion. No modern studies are better calculated to sweeten a life of toil than those of botany, zoology, and geology. We should like our readers to see the

new "Rochdale Field Naturalists' Journal" (a penny monthly) in proof of what we have said. It is a credit both to the society and the town.

"THE GARNER, AND SCIENCE RECORDERS' JOURNAL," is the name given to a new and ably-conducted monthly, edited by Mr. A. Ramsay, F.G.S. The principal aim of this magazine is to organise systematic investigation.

THE paper read before the Essex Field Club last October, by Mr. Worthington Smith, F.L.S. &c., (which attracted a good deal of attention), called "Botanical Mare's-Nests, chiefly Fungological," was reprinted at length in "The Gardening World" for October.

BARON VON MUELLER, the distinguished Government Botanist of Victoria, has recently described a new cycadaceous plant from South-Western Australia, which he has named after Professor Dyer, of Kew, *Encephalartos Dyeri*. The same botanist has also just described a new Papuan *Bassia*, which yields an edible fruit. He thinks that New Guinea is almost sure to yield from some of its Bassias and other sapotaceous trees new sources for gutta-percha.

IT is with much sorrow we have to announce the death (the result of an accident) of Dr. W. B. Carpenter, F.R.S., the distinguished physiologist and author, at the age of 72.

MR. CLEMENT L. WRAGGE has been commissioned by the Queensland Government to visit and report "as to the best means of establishing Meteorological Stations in Queensland, including Cape York Peninsula and Torres Straits." Mr. Wragge, who lately returned from a scientific expedition on his own account to North Queensland, commenced this important work early last month, and was expected to reach Normanton, in the Gulf of Carpentaria, about the 15th of last October.

WE are sorry to announce the death of Dr. Walter Flight, F.R.S., at the early age of forty-four. His "History of Meteorites," which appeared in the "Geological Magazine," first made him known to readers of popular science.

MICROSCOPY.

GLASS-COVERS IN THE TROPICS.—Never bring your thin glass into the tropics bedded in lime or chalk. I have seen many ounces of glass destroyed, or apparently so, by such means. Shortly after the glass has reached me, or even when received, the face begins to deteriorate, becoming first iridescent, and then opaque, like ground-glass, and for the same reason, the breaking up, not scratching, of the surface. This can be seen at once under the quarter inch. I noticed that glass which had been used to cover down did not fail in the same way as glass from the same box, unused and retained in the lime. Taking the hint, my last supply was sent out glued together by a little clove oil, run in between the plates by capillary attraction. I have had this last lot three months now, and the covers are perfect. —*I. W. P.*

DEVELOPMENT OF FLEA'S EGG.—The following are the references to the figures last month: Figure 175, First segment, head and mouth organs of larva × 250, a base of tubercle on the back of head and seen through the structure of larva. *b b b b*, Tubercles which assist in locomotion. *c*, Mandibles. Figure 176, Mandibles of same × 250. Figure 179, Newly emerged male flea × 25. Figures 177 and 178 are each magnified 25 diameters.

ZOOLOGY.

THE MOLLUSCA OF KERRY.—The following list of a collection of shells recently made in the neighbourhood of Dingle, co. Kerry, is interesting on account of the geographical position of that county, and for comparison with the south of England lists. *Tapes aureus*, *Venus gallina* (several), *V. linota*, *Lucina borealis*, *Tellina fabula*, *T. balthica* (a worn single valve), *Cardium edule*, *C. exiguum*, *Pholas candida*, *Psammobia ferroënsis*, *Mactra subtruncata*, *Pecten maximus*, *P. varius* (three varieties, the first purplish-brown, mottled with lighter, the second whitish with purplish-brown markings, and the third orange-brown). *Scalaria communis*, *Trochus zizyphinus* (several), *T. magus*, *T. cinerarius*, *Buccinum undatum*, *Cypræa Europæa* (both spotted and spotless forms), *Rissoa membranacea* (many), *R. parva*, var. *interrupta* (one), *Lacuna divaricata* (many), *Apporhaïs pes-pelecani*, *Nassa reticulata*, *N. incrassata*, *Littorina rudis*, *L. obtusata*, *Purpura lapillus*, *Murex erinaceus*, *Actæon tornatilis*. There were also a few landshells, *Helix ericetorum*, and its variety *alba*, and *Cochlicolla acuta*. In the above list of marine shells there are four species, *L. divaricata*, *C. exiguum*, *P. candida*, and *T. balthica*, not mentioned in Messrs. Smart & Cooke's list of Scilly Island Shells, but all these four are found in Kent, while eight others, *V. gallina*, *V. lincta*, *A. pes-pelecani*, *L. borealis*, *T. magus*, *P. ferroënsis*, *M. subtruncata*, and *T. aureus*, are not included in the Kentish fauna, although five of them have been taken on the Sussex coast. Wyville Thompson gives a list of mollusca dredged forty miles off Valentia, in 110 fathoms. It is a very remarkable one, and includes several species not before known as British, and others extremely rare. These are some of them, *Neæra rostrata*, *Verticordia abyssicola*, *Dentalium abyssorum*, *Buccinum Humphreysianum*, *Pleurotoma carinata*, *Ostrea cochlearis*, *Aporrhaïs serresianus*, *Murex lamellosus*, and *Trochus granulatus*.—*T. D. A. Cockerell.*

Trochus lineatus.—I found this species rather common on the rocks at Herm this year and very fine. One colony, however, had all the opercula much deformed, and in one or two cases it was altogether absent. Dr. Jeffreys, I believe, mentions a similar occurrence in his third vol. Mr. A. H. Cooke informs me that he has found *Buccinum undatum* on the Welsh coast, which had had the opercula, and part of the animals pecked out by gulls. This would account for total absence, but would it account for deformity or depauperisation? I saw no peculiarity in the habitat which would be likely to influence the growth of my shells. Does the operculum of molluscs grow again if removed?—*B. Tomlin, Pemb. Coll., Camb.*

BOTANY.

Polysiphonia fastigiata.—Accompanying the plate of *Polysiphonia fastigiata* in the August number, is a short statement purporting to describe the mode of propagation. This is, however, somewhat misleading, and I ask your permission to give those who have relied only on Mr. Draper's note the proper explanation. This plant bears three kinds of fruit, generally on distinct plants. The tetraspores are analogous to buds, are asexual, and divide into four parts (not more as stated) each of which is capable of developing into a plant. The antheridia drawn in the plate are the male fruit, and therefrom issue forth minute rounded bodies, called antherozoids. These bodies are washed near the female plants, on which is a projection readily noticeable under the microscope. From one part of this projection issues a very minute hair-like and unjointed process called a trichogyne, and to this trichogyne the antherozoids become attached, and thus effect the fertilising act which is followed by the complete development of the female fruit, the cystocarp (Ceramidium of Harvey's "Phycologia Britannica") containing the true spores. This fruit is, according to all good botanists, the basis of classification, and naturally the most important of all. But Mr. Draper has entirely passed this over without remark. The cystocarp (or ceramidium) is an even-shaped body, and the spores are arranged on a placenta near the base, and at maturity issue forth through an opening at the apex of the urn. The antheridia on a properly-mounted specimen, form a very beautiful object with the paraboloid and binocular.—*T. H. Buffham.*

Crocus nudiflorus.—This autumnal crocus is extremely abundant and quite wild in fields about Prestwich clough, about four miles N. of Manchester, and is also found in one or two situations on the south side of that city. It also occurs in fields sloping to the south near Singleton Brook, Kersal, and overlooking Kersal Moor, about one mile nearer Manchester than Prestwich. And again, it grows near Bury, about five miles farther north of this last-mentioned locality.—*J. Cosmo Melville.*

In the November number of the "Journal of Botany," I have enumerated the species and varieties of "Dianthus." As I am anxious to have an accurate topography of its distribution in this country, might I ask some of your readers to be so good as to forward to me on cards, local records (if possible from recent personal observation) of the indigenous British species, viz. *D. Armeria*, *deltoides* (with var. *glaucus*) *cæsius*, and *prolifer*?—*Frederic N. Williams, F.G.S.*

Metastasis in Leaves.—The results of some experiments on this subject by T. Sachs, which may be found recorded in the "Journal of the Chemical Society" for July, deserve notice here. It was found that in the case of many plants starch was found in the leaves in the evening, which disappeared during the night, so that they contained none by sunrise the next morning. It appears that, probably owing to its conversion by a soluble ferment into sugar, the starch is dissolved, passing into the stem. It is said that during each hour of the day a square metre of Helianthus was found to gain ·914 grm., and of Cucurbita ·68 grm. of starch, while during each hour of the night they lost respectively ·974 grm. and ·828 grm.

GEOLOGY, &c.

The Geology of Corstorphine Hill, near Edinbro'.—I have been engaged in examining lately, microscopically, a series of sections from the rock of Corstorphine Hill, near Edinburgh. This rock is described in all geological memoirs treating of the district as diorite. All the specimens but one, I found to have more or less the structure of diorite (though not at all typical), this exceptional one was nothing more nor less than a gabbro. This gabbro was a crystalline aggregate of labradorite (with very little oligoclase) diallage augite and a very little hornblende. The other specimens were diorites, but bore a distinct relationship to the gabbro. They were crystalline aggregates of labradorite, oligoclase, hornblende, and augite. Some of the latter mineral altered to diallage. The rock of Corstorphine Hill, therefore, as far as I have examined it, appears to be quite as much a gabbro as a diorite. It shows, at any rate, what I think has never been pointed out before, the close relationship existing between diorite and gabbro, and that one may pass into the other.—*Alex. Johnstone, F.G.S.*

The North Atlantic Basin.—The subject of Mr. Melland Reade's presidential address to the Liverpool Geological Society was "The North Atlantic as a Geological Basin." A chart, embodying the result of all the latest soundings, was exhibited

having contour lines showing the form of the ocean basin. Mr. Reade explained that in many localities the more frequent the soundings the greater and more numerous were the irregularities of the bottom, and from this he inferred that as the ocean bed became explored, many areas now supposed to be plains, would prove to possess reliefs similar to those of the land. There are submerged valleys and a mountain chain off the coast of Spain, and great irregularities in the soundings over the central ridge which traverses the Atlantic from north to south. The effect of the matter brought down by the great rivers the Amazon, Mississippi, and Congo was then dwelt upon, the conclusion arrived at being the existence of immense thicknesses of geologically modern sediment as submarine prolongations of the deltas proper, forming in many cases submarine plateaus to the great continents.

NOTES AND QUERIES.

NOTES ON BIRDS.—I observe a notice in your February number of a white sparrow being found at Anstruther. Here in the Phœnix Park, Dublin, near one of the vice-regal lodge gates may be seen any day a pure white chaffinch, flying about among the trees and shrubs in company of others of its family; the bird is familiar to the mounted police doing duty at the gate. On the centre road of the park may be also seen a jackdaw of peculiar colour, a bronzy lavender: he is an odd-looking bird: has stuck to the same locality for the last three years. The hawfinch or grosbeak is also to be seen in the park, one was shot last November. Very large flocks of red-wings frequented the park last month, but I have not seen any for the last week. The missel-thrush is common, feeding on the berries of the yew-trees, great fat fellows like partridges.—*William Dick, Phœnix Park.*

NEWT CASTING SKIN.—There is nothing unusual in the fact that the newt kept by G. A. Simmons swallowed its old skin. Most newts do so, as also do toads. It is very amusing too to see the latter disposing of his "old clo'." After pulling it off with his fore feet, he proceeds to roll it into a ball, and finally thrusts it into his capacious jaws and swallows it, as it were a huge pill. Newts will often cast off their skins and leave them floating in the water. If they (the skins) are then carefully floated on to a piece of glass and then allowed to dry, they form very curious and interesting objects.—*W. Finch, jun., Nottingham.*

ANDERSONIAN NATURALISTS' SOCIETY.—A meeting of gentlemen connected with Anderson's College, Glasgow, was held on the 25th August last, in the College, and a Natural History Society was formed, under the title of "Andersonian Naturalists' Society." A code of rules was adopted, and Professor A. S. Wilson, M.A., B.Sc., was chosen president. The meeting was very enthusiastic, and the prospects of the society are good. Old Andersonian men and Glasgow naturalists located at a distance from home, will be glad to hear of this venture, and wish the new society every success. Naturalists having anything to correspond on, or any assistance to tender, should communicate with the secretary, Mr. William Cumming, West-End College, Chryston, by Glasgow.

STARLING EATING EARWIGS.—Mr. W. Mattieu Williams, in SCIENCE-GOSSIP for October, mentions the case of a duck refusing to eat earwigs. About twelve years ago I was at a station where we kept our lamps and oil in a small wooden house at the end of the office. I also used to keep a few geraniums in the window of this house. During the summer months this place was swarming with earwigs; and I used to get a number of stems of the cow-parsnip, and cut them in lengths of seven or eight inches, and placed them among the flower-pots. When I examined the stems in the morning, they were always full of earwigs. I had a tame starling, which I took out with me when I went to examine the stems of cow-parsnip in the morning. When I shook the earwigs out of the stems on to the floor, the starling always devoured them as fast as it could pick them up. I also sometimes dug up the sand at the bottom of the wall, where there were numbers of earwigs concealed among the sand. When doing so, the starling followed after me, and greedily devoured every earwig that made its appearance.—*F. Brebner, Portlethen, by Aberdeen.*

LUNAR RAINBOW.—One night, about the third week in August (I have forgotten the exact date), I was out collecting at the back of Cæsar's Camp, Folkestone, when, about 10 P.M., I noticed the left-hand half of what appeared to be a rainbow. The moon was moderately bright at the time, occasionally covered for a few seconds with small clouds, and, as far as I could judge, was due west. A fine rain had been falling for three or four hours. It was a silvery green, and stood out rather clearly against the dense black clouds that filled the east. After some little time it vanished and the right-hand half appeared, from which side it gradually extended until it formed the complete arc. Is a night rainbow of common occurrence?—*Louis Jarman.*

FREEZING MACHINE.—In reply to J. P., he will find an account of Carré's Continuous Freezing Machine, which produces 800 lbs. of ice per hour, in Richardson & Watt's "Chemical Technology," part v., page 296.—*Ernest Hanwell.*

FRESH-WATER SHELLS.—I have little doubt that similar incidents are more common than is generally supposed, and I have myself frequently met with them. I have often seen the toes of newts, frogs, and toads firmly grasped by small bivalves (*Sphærium corneum*). A short time ago I caught a fine warty newt (*Triton cristatus*), with four Sphæriums firmly attached to its toes, and they seemed to have been clinging there for some time, for the poor creature's toes were quite white and transparent, as if they had been sucked by their shelly appendages, and it could with difficulty stumble along. I once captured a toad that was tramping leisurely along the roadside, in the dusk of evening, with a full-grown *Limnæa peregra* on its back. But the most curious instance of this transportation of mollusca from one locality to another came under my observation one evening when returning from a moth-hunting expedition. A big beetle came booming slowly along, and a random sweep of my net secured it. It proved to be a fine water-beetle (*Dytiscus marginalis*), and I was surprised to find a full-grown Sphærium firmly clinging to one of its feet, and thus being conveyed by most unlikely agency to some far distant locality. It is quite likely that the larger bivalves, such as the Unios and Anodons, may often be removed by wading birds, as they usually lie with their valves slightly open, and the toe of the bird being introduced, the shell would firmly close, and then be carried away by the bird

thus conveniently clogged, to be afterwards dropped in another sheet of water; and if it chanced that the shell thus conveyed were full of ova, the pond, if barren before, would soon become populated. Such molluscs as deposit their ova in gelatinous masses, as the Limnæa, Planorbi, &c., may readily have these ova masses conveyed from pond to pond by small reptiles such as the frog or toad, or even by birds and rats. To my mind, these instances I have noted, very satisfactorily account for the sometimes apparently inexplicable populations of ponds and other sheets of water, and the distribution of various species of mollusca. In a recent issue of the "Field," an instance is related by a correspondent when a large fresh-water mussel was found, having between the valves the toe of a small bird, apparently that of some species of Turdus, perhaps a blackbird; and two other instances have lately been recorded in the same paper, one of a wader being caught by a cockle, and another of a snipe being shot which had a small Sphærium clinging to its toe. It was for long a problem to the late Charles Darwin:—How it came about that mussels and other shells which can neither fly nor walk, can migrate from one pond to another? This was solved by some boys who found some frogs, and a Dytiscus, with small mussels clinging to their legs, and who made bold to write to him, asking if he could give them any explanation of it, and he wrote very kindly in return, thanking them for the light they had thus thrown upon a subject which had long been an enigma to him. Only two or three weeks before his death, Mr. Darwin wrote a letter on the subject of the "Dispersal of Fresh-water Bivalves," in which he relates an instance of a Unio being found attached to the tip of the middle toe of a duck, shot on the wing, as well as other important facts of the same kind.—*R. Standen.*

Ants and Birds.—In reference to Mr. Mattieu Williams' notes respecting the duck's great antipathy to the ant, I may mention that I have noticed the same thing myself in many other birds. When hens hatch off young pheasants, it is usual for the keepers to feed the young birds on ants' eggs, for which purpose they frequently place a whole ant-hill with eggs and ants all together near their coop for them to scratch at. The pheasants will devour the eggs greedily, but I notice that they will not touch the perfect insects, but avoid them as much as possible. The old mother hen too, is in great fear of these active little insects, but in spite of all her endeavours to keep clear of them, many generally manage to crawl amongst her feathers and make her very miserable. Thrushes, blackbirds, and starlings will not touch these creatures, for I have frequently tried them, they nevertheless show a great liking for them in the larva state. I once killed a red backed shrike which was industriously pecking and foraging on an ant-hill, and on dissecting it I found about a dozen ants, a few larvæ, and a large number of small beetles belonging to a species which are principally found in ants' nests. All oologists must be familiar with the peculiar notched and long tongue of the birds of the woodpecker tribe, and many no doubt have seen them busy at work and eating. They dig a deep hole into the midst of the ants' homes with their strong beak, and then thrusting in their tongue, allow it to remain there for a moment, when they draw it out covered with the insects which they eat with great relish. I have often wondered why it is that some birds have such a dislike for ants, whilst others number them amongst their favourite morsels.—*William P. Ellis.*

White Flowers.—Three specimens of white *Ajuga reptans* were found this summer, in the neighbourhood of Llwyngwern; also on a mountain, not far from the same place, three kinds of white heather, *Erica Tetralix*, *E. cinerea*, *Calluna vulgaris.* —*M. E. Thomson.*

Eggs.—We have occasionally observed on the small stems and surfaces of the leaves of horse-chestnut and sycamore, lumps of transparent jelly clear as water with a slightly ribbed outline, containing inside at about equal distances, though set near together, small yellow eggs a little larger than common spiders' eggs. These curious objects are found on the outside leaves of lower branches hanging over a deep freshwater pond, far away from the tree-trunk, but nowhere coming nearer than two or three feet to the surface of the water. Seen in a microscope of about 220 power the jelly is still clear as water; the eggs look the same as before only larger—something like the yolk of a hen's egg to the naked eye, but a less dark yellow. They were found in August and September. If any correspondent could tell what kind of reptile or insect may have laid these eggs it would be very interesting.—*M. C. R.*

The Knot.—It is a very unusual thing to find a knot (*Tringa cornutus*) in summer plumage on the English coast. Such an one, however (a female), was shot during the second week in August on the banks of the river Ribble below Preston, and was purchased by J. B. Hodgkinson, who now has the specimen in his possession. He remarks that although a great many specimens of this species have passed through his hands at various times, it is the first he ever had in summer plumage. There seems to be a deal of uncertainty attached to the nidification of these birds, which visit our shores in immense flocks during the autumn and winter. The eggs have rarely if ever been taken. During the explorations of Captain Sir G. S. Nares in the Arctic seas in the years 1875-6, Mr. Hy. W. Fielden (who was naturalist to the expedition), when camping at Knot Harbour, Grinnel Land (lat. 82° 33′ N.) noticed the first arrival of a flock of knots on June 5, 1876, which circling over the hillside, alighted and fed eagerly on the buds of the purple saxifrage (*Saxifraga oppositifolia*). They began to mate soon after their arrival, and although careful search was made by various members of the expedition during the months of June and July they were unable to find either nest or eggs. But on July 30, a male bird and three nestlings were captured near the ship. An albino var. was shot near Maldon, in Essex, Feb. 13, 1851. I shall be glad to hear of any authentic instances of the knot's eggs being found, and to have a description of them.—*W. Hy. Heathcote, Preston.*

Willows struck by Lightning.—On the 19th of May, a large sized willow-tree, growing in a field close to this town, was struck by lightning, which literally wrenched the trunk asunder from the top to the bottom, tearing off one side of it, and leaving the remainder standing. The torn surface of this bears no marks of having been burnt or charred by the flash, but is comparatively smooth, and has the appearance of having been simply split by a great force, except that for a breadth of four or five inches down the centre the wood hangs in shreds with its texture almost completely destroyed. On the 1st inst. I examined the mutilated trunk left standing, and found that it had not been killed and that its leaves were quite fresh and green. Two men working in the field saw the lightning strike the tree,

and say that splinters of wood flew about in all directions. The flash was immediately followed by a very heavy peal of thunder, the vibration caused by which, broke several windows in houses about 200 yards from this tree.—*Wm. Self. Weeks.*

MIMULUS LUTEUS.—This gay flower grows in some abundance on the banks of the stream at Perranwharf, Perranarworthal, Cornwall. I have observed it during the past three summers. It occurs on both sides of the river in company with the common rag-wort.—*T. J. Porter.*

BADGERS IN WORCESTERSHIRE.—I saw one lately (in October) which had been shot near Avechurch, and another was killed in the early summer near Bartley.—*K. D. Cofton.*

SEA-BIRDS IN WORCESTERSHIRE.—A pair of kittiwakes were on the reservoir here at Whitsun, and an oyster-catcher for a couple of months; since then common and lesser terns and a shag (all birds of the year) have been shot there. There are now two couple of green sandpipers about, and in the alder-trees near a flock of that most charming of little birds, the siskin.—*K. D. Cofton.*

FAUNA OF STAFFORDSHIRE.—In case your correspondent Mr. Masefield has not seen the book, I quote from R. Garner's "History of Stafford," the statement that Daubenton's bat has occurred at Burton, and (from the Supplement) that the whiskered bat has been taken in the same country.—*J. Kelsall, Fareham.*

HAS PHOLAS EYES?—As far as is at present known, visual organs in the Lamellibranchs exist only in the genera *Pecten*, *Cardium*, and *Spondylus*, where they are found on the edge of the mantle, and in *Pecten* number about 100. It will therefore be of great interest if Mr. Marrow or anyone else can discover eyes in Pholas also, for they certainly seem to be indicated by Mr. Marrow's remarks.—*T. D. A. Cockerell.*

BREEDING FLEAS.—Some years ago I carried out a series of investigations into the life history of the cat flea, collecting the eggs, keeping them until hatched, and during the process making observations upon the various changes they underwent. These eggs may be easily obtained in considerable numbers by examining carefully the place where the cat is in the habit of lying, but there is other material as well which requires to be collected simultaneously for a reason I shall explain. The eggs themselves are easily detected, and by close observation scattered amongst them may be seen numerous little masses of a dark red colour. This material is apparently partly digested food derived from the sanguineous fluid of poor puss, and is undoubtedly designed to serve as food for the insect during the period it remains in its larval condition. It seems probable therefore that some similar provision exists in the case of the common house flea, and it was for the want of this probably the only suitable food that Mr. Harkus failed to mature a larger number of his specimens. I should like to know whether he noticed any such masses as I have described associated with the eggs of the fleas, and I feel much interested in any further investigations into the subject he may carry out.—*G. E. Cox, Leyton, Essex.*

CROCUS NUDIFLORUS.—A well-known locality in the north of England is by the Mersey, in meadows between Northendon and Didsbury, near Manchester. I gathered it there, Oct. 5th, 1878.—*B. B. Le Tall.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than formerly, we cannot undertake to insert in the following number any communications which reach us later than the 8th of the previous month.

TO ANONYMOUS QUERISTS.—We must adhere to our rule of not noticing queries which do not bear the writers' names.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

S. HOWARTH.—From your sketch we judge that the white sea-weed is the common coralline (*Corallina officinalis*). See Taylor's "Half-Hours at the Sea-side."

J. B.—We believe that the new edition of Yarrell's "British Birds" contains figures of all the species.

A. SMITH (Invergordon).—The existing marine shells occurring in the "vegetable mound" may be the remains of an old sea-beach; or they may represent some "Kitchin Midden." It is impossible to tell without strict details. But at any rate it is worth your while to investigate all the phenomena.

H. P. MARSHALL.—Get Dr. Lankester's little work on "The Microscope" (edited by Mr. F. Kitton), price 2*s*. 6*d*., published by Messrs. W. H. Allen & Co., Waterloo Place, London.

CLEVEDON.—Get Stark's "British Mosses," coloured illustrations, price 10*s*. 6*d*; Rye's "British Beetles," coloured illustrations, price 10*s*. 6*d*; Rimmer's "Land and Freshwater Shells," photographs of species, price 10*s*. 6*d*; Dr. Cooke's "British Fungi," coloured illustrations, price 6*s*.; see also Dr. Cooke's "Ponds and Ditches," for common British freshwater algæ (price 2*s*. 6*d*.), and "British Lichens," by Dr. Lindsay, coloured illustrations, price 10*s*. 6*d*.

J. F.—The fungus on the leaves of *Adoxa moschatellina* are "cluster cups" (*Œcidium*); see Cooke's "Microscopic Fungi."

J. W. ODELL.—Thanks for the very interesting specimens of *Tropæolum tuberosum*, showing various degrees of fasciation. Article on the same will appear next month.

A. P. CARTER.—"Elements of Mineralogy," by F. Rutley (London, Murby & Co., price 1*s*. 6*d*); or Dana's "Mineralogy," price 7*s*. 9*d*. (London, Trübner & Co.), would help you, especially the first mentioned capital little book.

G. M. B.—No. 1 specimen is the pretty water-wasp (*Fontinalis antipyretica*: No. 2 is a species of freshwater alga.

EXCHANGES.

WANTED, Testacellæ, either shells or living specimens, also fine or peculiar specimens of other British land and freshwater shells for figuring. Good returns will be made in foreign shells.—J. W. Taylor, Outwood Lane, Horsforth, near Leeds.

WANTED, members for the Scientific Circulating Magazine Society. Address for particulars—T. F. Uttley, 17 Brazennose Street, Manchester.

A QUANTITY of first-class slides to exchange for good books. Wanted, Cassell's "History of England."—J. W. Tutcher, 22 North Road, Bristol.

OFFERED, Margaret Plues' "British Grasses," coloured illustrations, 1869, in good condition; J. E. Taylor's "Half Hours in the Green Lanes," 1879, good condition; J. G. Wood's "Common Objects of the Sea-Shore," coloured illustrations, fair condition; J. G. Wood's "Lane and Field" (Natural History Rambles), 1879, good condition; M. C. Cooke's "Ponds and Ditches" (Natural History Rambles), 1880, good condition; George Barnesby's "Our Native Song Birds, Warblers, and Canaries," in exchange for Réaumur's "Natural History of Insects relating to the Diptera," original, or English translation.—Miss C. Leigh, 37 Portman Square, London, W.

WANTED, Gray's "Anatomy" (descriptive), latest edition; also a stand condenser for microscope.—J. B. Mayor, 5 Queen's Terrace, Longsight, Manchester.

EGGS of following species: pied flycatcher, nightingale, stonechat, Dartford warbler, wood warbler, creeper, great tit, rock pipit, cirl bunting, hawfinch, goldfinch, any species with cuckoos' eggs; a liberal exchange for any of above.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

FIRST-CLASS anatomical injections from cat, rabbit, guinea-pig, &c., for magic-lantern slides or natural history objects.—Henry Vial, Crediton, Devon.

WILL exchange for botanical works, or conchology, entomology works, or any useful exchange, 20 numbers Cassell's "Dictionary," 21 numbers Cassell's "Countries of the World," 5 numbers Cassell's "Picturesque Canada," 5 numbers Cassell's "Egypt," and 9 numbers Cassell's "Butterflies and Moths," all perfectly clean.—J. Taylor, Duke of York Hotel, Eccles.

NEW lantern slides of Scottish scenery (unmounted) in exchange for others. Lists from—J. M. Bain, 12 Waterloo Street, Glasgow.

WANTED, British land and freshwater shells. Offered in exchange, micro-material, slides, or other shells.—J. Moore, 86 Porchester Street, Birmingham.

WANTED, good chalk fossils; send list; also flint implements in exchange for fossils from other formations.—Geo. E. East, Junior, 10 Basinghall Street, London, E.C.

WANTED, Sachs' "Botany," Hooker's "Students' Flora," Babington's "Manual," and other scientific books. Will give good micro-slides in exchange.—Samuel M. Malcomson, M.D., 55 Great Victoria Street, Belfast.

WANTED, foreign Lepidoptera or good English, in exchange for a series of 41 well-mounted micro-slides of British and foreign zoophytes, all different, and all named.—J. Lilley, 2 Royal Promenade, Clifton.

SIDE-BLOWN eggs, one hole: starling, wood pigeon, blackbird, thrush, redstart, house sparrow, greenfinch, brown linnet, yellow bunting, chaffinch, turtle dove. Desiderata, ova, pupæ, butterflies, moths, or British birds' eggs.—F. J. Rasell, 19 Raglan Street, Peas Hill Road, Nottingham.

VALUABLE collection of British land, freshwater, and marine shells, 360 species, nearly 2000 specimens; offers requested.—Thos. H. Hedworth, Dunston-on-Tyne.

WANTED, the "Natural History of Selborne," fully illustrated, "Familiar Wild Birds," Brown's "Practical Taxidermy," Cassell's "European Moths;" will exchange several good books, 2 fine cases of stuffed birds, and about 400 duplicate specimens of moths, good, for others or birds' eggs, and birds for stuffing.—Joseph Bates, 10 Orchard Terrace, Wellingborough.

WANTED, an ⅛ inch objective; will exchange 3 vols. of "Picturesque Europe," bound in half-calf, new. Cost £5 14*s*.—S. S. Ovens, 150 Lintburn Street, Galashiels.

WANTED, L. C., 7th edition, 106, 358, 611, 979; offered, 575, 500, 1646, 1650, and many others. State wants to W. W. Reeves, 2 Geneva Road, Brixton, S.W.

WELL-made cabinet, 12 drawers, graduated in depth, nearly new. Mahogany show-cases, and over 200 species of shells for exchange. What offers? Fossils from Upper Miocene of France preferred.—Miss Linter, Arragon Close, Twickenham.

SUBSCRIBERS' edition of Cassell's "History of the United States," by Edmund Ollier, 3 vols., complete, unbound, profusely illustrated with wood engravings, and 30 steel plates; cost 30*s*., exchange for Geikie's or other good text-book of geology or geological cabinet.—H. P. Dodridge, 7 Wharton Street, W.C.

WANTED, fossils, any formation, in exchange for about 150 butterflies, all good specimens.—A. E. Dodridge, 7 Wharton Street, W.C.

WANTED, Berkeley's "Mosses" in exchange for mosses or good fossils.—Mrs. Bishop, The Platts, Watford.

WANTED, SCIENCE-GOSSIP, No. 230, February 1884. Offered, two well-mounted micro slides; or, if preferred 1*s*. will be paid.—W. J. Atkinson, 131 Queen's Road, Peckham, S.E.

MICRO slides: a number of well-mounted duplicates in exchange for others or good material; also a lot of miscellaneous unmounted objects for disposal.—Mathie, 42 McKinlay Street, Glasgow.

HALL'S "Dictionary of Science," fine old work in three large folio volumes, 150 full-page plates, date about 1790, in exchange for good high-power for microscope or accessories, paraboloid.—Henry Kendall, B.A., 17 Marmion Road, Liverpool.

WANTED, a few ounces of foraminiferal sand from Dog's Bay, Ireland; will give in exchange micro slides. State requirements to—Edward Halkyard, The Firs, Knutsford, Cheshire.

DUPLICATES: *Balea perversa, Trochus lineatus, T. magus, Venus exoleta, O. otis, Lasæa rubra, P. glycymeris, Tapes virgineus, Venus verrucosa, H. tuberculata, Helix pisana, Trochus agathensis, Rissoa striata, Helix aspersa* var. *tenuior, L. neritoides*, &c. Desiderata: British and foreign shells.—B. Tomlin, Pembroke College, Cambridge.

FRESH collected "cluster cups" on the large willow herb, *Æcidium Epilobii*, neatly mounted, offered in exchange for other slides, anatomical ones preferred. Send list.—G. Garrett, 30 Palmerston Road, Ipswich.

DUPLICATES: *Lasæa rubra, Trochus lineatus, T. zizyphinus, Balea perversa, Rissoa cancellata, F. Græca, E. rosea, Æ. aciculatus* (a few), *Hydrobia ventrosa*. Desiderata: shells, British and foreign.—B. Tomlin, 59 Liverpool Road, Chester.

BRITISH shells, including *Cl. biplicata, H. lamellata, Pal. contecta, Ach. acicula, Odostomia plicata, O. rissoides, O. dolioliformis*, and a large number of others. Wanted, rare species and varieties, or back numbers of "The Portfolio" and other art journals.—S. C. Cockerell, 51 Woodstock Road, Bedford Park, Chiswick, W.

WILL exchange the following and others for British marine or land and freshwater shells: *Testacella haliotidea, Z. glaber, Z. radiatulus, Z. nitidus, V. antivertigo, Cl. biplicata*, and *C. minimum*.—F. G. Fenn, 20 Woodstock Road, Bedford Park, Chiswick, W.

WANTED, "Trans. Linn. Soc." (Zool.), Dec. 1883; will give subsequent parts, equal value.—F. N. Williams, F.G.S., 181 High Street, Brentford.

TWO neat book-boxes, 15 × 11, corked for insects, gold lettered. Wanted in exchange, pupæ of *Saturnia pyri, S. Io, Samia Cecropia, Telea yama-maï*, imagos of exotic Lepidoptera, set or in papers.—Robert Laddiman, Hellesdon Road, Norwich.

VARIETY of double-stained wood sections, dahlia, vine, elder, &c., to exchange for other good slides.—H. B. Linthorn, 130 Hampton Road, Clifton, Bristol.

WANTED, localised Foraminifera from the chalk of Ireland, south and east of England, also from other sources, unmounted. Good micro slides offered in exchange.—Calx, 15 Horton Lane, Bradford.

WILL give Cynthia and Pernyi cocoons for Machaon, Sinapis, Cratægi, Hyale, Daplidice, *C. album*, Antiopa, Sibylla, Epiphron, *W. album*.—J. Roseburgh, 18 Bank Close, Galashiels.

I HAVE been collecting land and freshwater shells for some little time, but I find great difficulty in naming my specimens. Would some reader of SCIENCE-GOSSIP kindly help me?—C. Chaytor, Scrafton Lodge, Middleham, Yorkshire.

WHAT offers for, fin-spines, teeth, scales, palates, vertebræ, and bones of fish from coal measures?—T. D. Atkinson, Tibshelf Colliery, Alfreton.

SEVEN species of S. American bird skins, in good order. Also SCIENCE-GOSSIP for 1872,-3,-4,-5, in 2 vols. Wanted Wood's "Nat. Hist." (Mammalia), and "Insects at Home." For particulars write to J. H. Keen, 18 Church Street, Spitalfields, E.

WELL-finished slides, micro-fungi, spicules of sponges and gorgonias, palates of mollusca, &c., for other good-mounted or prepared objects.—A. D. Thompson, 139 Shirwood Street, Nottingham.

WANTED, books on natural history, in exchange for well-mounted micro-slides. Botanical or insecta.—W. S. Anderson, 7 Granby Street, Ilkeston.

WILL exchange, L. L. Clark's "Seaweeds." J. G. Wood's "Common Objects of the Microscope," and Thos. Moore's "British Ferns" for other natural history books.—W. S. Anderson, 7 Granby Street, Ilkeston.

MICRO-slides, well-mounted, of vegetable sections, trans. and vert., double stained, and others, in exchange for mosses or algæ.—Rev. H. W. Lett, Lurgan.

BOOKS, ETC., RECEIVED.

"Palæontology of the Eureka District," by C. D. Walcott Proceedings of Geologists' Association, (V. S. Geol. Surv.).—"Report of Rugby School Nat. Hist. Soc."—"Journal of the Royal Microscopical Society."—"The Naturalists' World."—"Ben Brierley's Journal."—"The Train."—"Cosmos."—"The Botanical Gazette."—"Science."—"The Asclepiad."—"Liverpool, Science Students' Association."—"Proceedings of the Academy of Natural Sciences of Philadelphia."—"The Canadian Entomologist."—"The American Monthly Microscopical Journal."—"The Amateur Photographer."—"Ben Brierley's Journal."—"The Gardening World."—"Rochdale Field Naturalist's Journal."—"Observations on Zooglœæ," by W. Trelease.—"The Poets' Beasts," by Phil. Robinson (Chatto & Windus).—"Myths and Dreams," by Edward Clodd (Chatto & Windus).—"The World's Lumber Room," by Selina Gaye (Cassell & Co.).—"The Ocean, a Treatise on Ocean Currents and Tides," &c., by W. Leighton Jordan, F.R.G.S. (London, Longmans).—"The Wanderings of Animals and Plants," by Victor Herne, edited by J. S. Stallybrass (London, Swan Sonnenschein & Co.)—"Short Studies from Nature" (Cassell & Co.).—"Proceedings of the Liverpool Hist. and Phil. Soc.," vol. 38.—"Chemical Students' Manual," by H. L. Buckeridge (London Thos. Murby).—"Heat, Sound, and Light," by R. Wormell (London, Thos. Murby).—"The Aryan Maori," by Edward Tregear (Wellington, Geo. Didsbury).—"British Cage Birds," by R. L. Wallace, parts 2 and 3 (London, L. U. Gill).—"Poultry," parts 1 and 2, by Jos. Long (L. U. Gill).—"Book of the Goat," by H. S. H. Pegler, part 1 (L. U. Gill).—"Fancy Pigeons," parts 1 and 2, by J. C. Lyell (L. U. Gill).—"Longitude by Lunar Distances," by Major H. Wilberforce Clarke (London, W. H. Allen & Co.)

&c. &c. &c.

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INDEX TO VOL. XXI.

Errata in Last Year's Index, for Mollusca of Derby, read Mollusca of Derry.
Vol. xx. p. 277, for Baun, read Bann.

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